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Aluminum Foil and Powder

Notes on Their Manufacture

By METALLURGIST

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Aluminum Foil

THE manufacture of aluminum foil is of great industrial and practical importance in view of the many uses to which it can be applied. The processes of manufacture are, however, not free from numerous difficulties which have had to be overcome in the production of a perfect product.

Production commences by casting rolling blocks into iron molds, the metal is poured at 750° C. to 770° C. and the finished blocks measure about 70 x 32 x 12 cms. The greatest care must be exercised to avoid the inclusion of dross and oxide in making these blocks, otherwise the difficulties of the subsequent rolling operations will be much increased.

Rolling is accomplished initially at about 420° C. which corresponds incidentally to the temperature at which wood chars and smokes so that this can be used as a rough test of the temperature. More accurate work is done by using a pyrometer of the now well-known "flat iron" type which is held against the rolling slabs to see that the temperature is right. Precise accuracy of rolling temperature is not necessary.

The first operation is rolling to a thickness of 33 mm. which gives a sheet measuring about 35 cms. wide and having irregular edges.

Four strips about 8 cms. wide are cut from the sheet, these are reheated at 420° C. and cold-rolled in three stages.

The rolled material is coiled up on a suitable reel and re-rolled after passing through guides on the rolls so as to keep it central with the rollers.

The rolling is repeated six times until the thickness is 4/100 of a mm. Further reduction is effected either by hammering or by special additional rolling.

Hammering or Beating Operation

Strips of the thickness noted above and one meter in length are made into piles of 500 each; these are reannealed and hammered under pneumatic hammers (see Fig. 1), until they are reduced in thickness to 3/100 of a mm. each. Two blocks of hammered foil each containing 500 sheets 3/100 of a mm. in thickness are then put together one above the other and the 1,000 sheets are subjected to further hammering until the thickness of individual sheets is 2/100 of a mm.

Next a further bundle of 1,000 sheets is superimposed upon the first 1,000 and hammering is continued again until the thickness is reduced to 1/100 of a mm.

The hammering or beating operation which is comparable to the gold beating process, well known, is accomplished by small pneumatic hammers which deliver 300 blows a minute, each hammer weighing 300 lbs. Thick

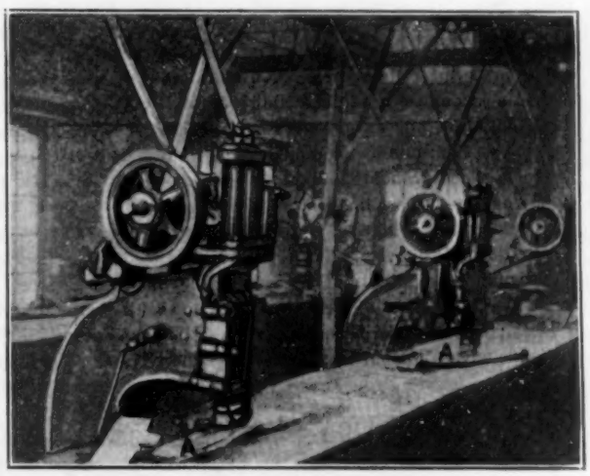


Fig. 1.—Pneumatic Hammers for Beating Aluminum Foil

zinc plates are placed above and below the bundles of aluminum foil to be beaten.

The losses involved in this process are considerable from the operations of rolling, cutting to size, hammering and most of all from the sticking together of foil when finished. The net good output does not usually exceed 35 per cent of the weight of rolling blocks originally started with.

One of the greatest difficulties is the operation of cutting the foil up into suitable sizes, wherein there is a great tendency for the foil to stick together, to be actually welded together on account of the pressure of one sheet against another.

The rolling and hammering operations expel all air from between the sheets and the thin layer of aluminum

oxide which may exist upon the foil is broken down by the heavy pressure applied in cutting up. The aluminum foil thus left bare virtually welds together and is impossible to separate.

In order to overcome this difficulty all sorts of devices have been tried and used with a certain measure of success.

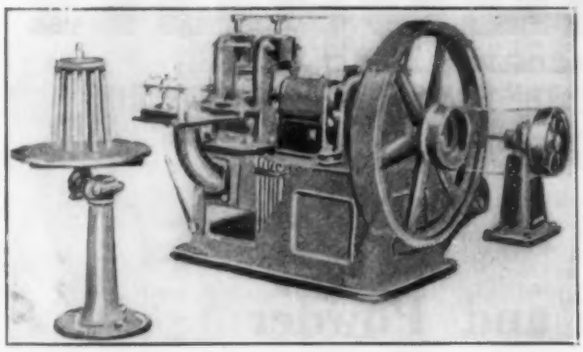


Fig. 2.—Rolling Mill for the Manufacture of Aluminum Foil

It is sometimes usual to have a layer of thin paper between each layer of foil or to take the hammered bundles with their edges trimmed and pass the bundles through a special type of roll, one cylinder being made of hard paper and the other of steel—this process effects separation to a certain degree.

Production of Foil by Rolling

When for various reasons it is preferable to produce aluminum foil by rolling operations rather than hammering or beating, the sheets are greased and rolled two at a time down to a thickness of 2/100ths of a mm. and form together down to 1/100 of a mm. in such a mill as is shown in Fig. 2.

Up till a few years ago aluminum foil was produced exclusively by the method known as pack rolling. Sheet was rolled down on a two-high mill to about double the length and so on until the desired thinness was attained. The objection to this method was that separating the sheets was an expensive and tedious operation. This has now given way to the simpler and cheaper methods of strip rolling, employing heavy pinches and considerable tension on the material.

By this method aluminum foil can be supplied, not only in sheets of any dimensions, but also in long strips, which is of great value to chocolate and tobacco packers, enabling automatic packing machines to be employed, which are fed with strip in long lengths from coils.

Up till a few years ago it was not possible to produce aluminum foil thinner than 0.007 mm., but recent developments have enabled foil down to 0.005 mm. to be produced on a commercial scale, and the end is not yet in sight.

The cutting up of such sheets when they are used for wrapping various commodities presents difficulties owing to the sheet breaking but when such foil is used in automatic machinery such as for the wrapping of chocolate and other similar purposes breaking of the foil presents no special difficulties. The material in these machines is used in lengths of 16 meters or so made into rolls.

Ruffled or corrugated aluminum foil has quite a different color from that of the smooth rolled and polished foil; this is because of the numerous minute surfaces which reflect and re-reflect the light to the eye giving the impression of a different shade of whiteness.

Such a frosted appearance is of value in certain directions and large quantities of aluminum foil are produced with this appearance.

Applications and Properties of Aluminum Foil

During recent years aluminum foil has made great strides and has now practically displaced tin foil for all but special purposes. More than 10% of the present output of aluminum in Germany is stated to be consumed by the foil industry, which employs thousands of workpeople in the rolling mills and decorative and allied industries.

Aluminum foil is used not only in the plain white grade, but is now colored and decorated with any desired design, and is embossed with names or trademarks.

Aluminum foil is a most hygienic packing material. For rolling into thin foil only the purest aluminum can be used, not less than 99.2% Al., whereas the purity of tin foil varies between 96 and 98% Sn., with 0.1-0.2% Pb., and 2.4% antimony. The small quantities of iron and silicon in aluminum are both harmless, but abnormal proportions of lead or antimony in tin foil may easily be very harmful.

Another advantage of aluminum from the hygienic point of view is the long annealing at 500° C. to which the foil must be subjected at the end of the rolling process and shortly before dispatch. This high temperature certainly destroys traces of dirt that the foil may have taken up during the process of rolling, whereas with tin foil this is not even possible owing to the lower melting former is odorless whereas the latter always smells slightly of the lubricating oil used in the rolling process.

Outside of the packing industry aluminum foil is also finding many interesting applications. It is used largely in the wireless industry in connection with condensers and in cable manufacture. A new use is in connection with the heat insulation of steam pipes. The thin strip used for decorative effects on Christmas trees and similar purposes is also now made from aluminum foil.

The chief consumers of aluminum foil, whether white or colored, plain or embossed, are the chocolate, cigarette and tobacco manufacturers, but it is now finding increasing use for packing biscuits, bread and sweets, and for cheese, soap and pharmaceutical products. A new use is for dressing wounds, as owing to its high melting point of 650° C. it can be sterilized by heating to, say 500° C. without harm.

Price

Hand in hand with these technical improvements in methods of production, and mainly due to them, a steady reduction in the price has taken place. The price of dead white foil of .009 mm. in 1910 was about M. 10 per kilo., while in 1929 this had been reduced to M. 4.20. This shows a very large saving over tin foil, taking into account the difference in specific gravity, which is 7.2 for tin and 2.6 for aluminum.

Aluminum Powder

Which is used principally in the manufacture of aluminum paint is generally produced from the scraps and waste resulting from the manufacture of foil.

The process involves hammering and rolling operations which reduce the foil into the form of flat, thin, irregularly shaped flakes—which to the naked eye looks like powder. Under the microscope the powder can be clearly seen to consist of small flakes, but a few thousandths of a millimeter in thickness and of which the other dimensions are relatively larger.

The first stage of the manufacture of the powder is a delicate hammering operation to break up the scraps of foil into minute shreds; this is accomplished by a machine as shown in Fig. 3.

This machine delivers 75 blows a minute to the powder contained in a cup-shaped mortar of special construction.

Lubrication is continuously and automatically effected

by an opening connecting with the stamping chamber—finished powder is also automatically discharged.

Lubrication is effected by stearine which is grated into powder form but after entering the machine rapidly becomes liquefied owing to the heat due to the hammering. Were it not for this introduction of stearine the particles of aluminum would soon all become welded together into a solid block. The stearine is mixed to the extent of about 2 per cent with the aluminum scraps before being fed into the mortar.

After leaving this machine the powder is passed through a silk sieve of 200 mesh and that which passes through is considered sufficiently fine for most classes of work. What will not pass through the sieve is returned to the stamping mill.

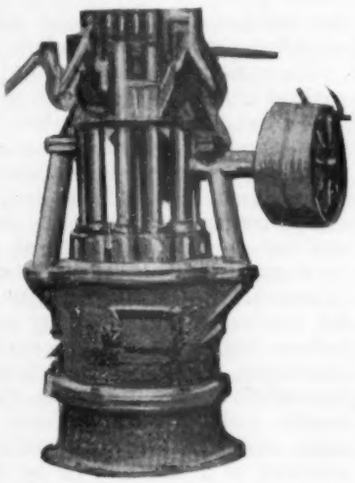


Fig. 3.—Hammering Machine for the Production of Aluminum Powder

The material which passes through the sieve is further graded into coarse, medium and fine by introduction into a machine which consists of a vertical cylinder having a vertical revolving central shaft to which is attached a fan at the bottom. The powder of 200 mesh is passed into this machine and the paddle or fan is started to revolve. This raises the finest powder into the air in the cylinder and a certain amount of this is caught in an annular internal trough at the top of the cylinder.

Half way down the cylinder there is a similar trough which catches the grade of powder which is not light enough to rise to the top trough.

Lower still there is a further trough which catches the heaviest grade of powder.

The powder collected in these grading machines then needs to be polished so as to make it shiny. This operation is accomplished in a polishing machine consisting of a corrugated, polished, steel, horizontal cylinder through the central axis of which runs a horizontal shaft having brushes attached along its whole length; see Fig. 4.

The brushes bear along the entire interior surface of the cylinder and the friction of the brushes polishes the powder by causing the particles to rub upon the steel surface and upon one another.

The polishing operation takes about 10 hours and the powder is then finished: it is discharged from the machine and to shipping drums by means of a screw conveyor.

Owing to the danger of explosions, which sometimes occur in this apparatus, this operation is always carried out in small pavilions isolated from the main factory.

The constant rubbing of the brushes upon the minute aluminum particles and of the particles upon one another generates considerable heat which occasionally results in ignition and explosion. Aluminum powder in such a fine state of division is very ready to oxidize and is liable to do so with explosive violence.

Aluminum Paint

The principal use of aluminum powder is in the manufacture of aluminum paint which is largely used as a rust preventive on outdoor constructions and as a decorative medium for indoor use.

Owing to the high coefficient of expansion of aluminum paint it does not readily crack off steel structures when, in the summer, these may become heated by the sun. Aluminum paint is used for a multitude of purposes and new applications are being found and developed every day—it is employed for covering gas and water pipes and radiators in central heating.

This latter application is a mistake because it is well known that aluminum paint being bright, white, and reflective prevents the emission of heat from a hot object and actually dead black paint is more suitable for the covering of radiators since the emissivity of such a paint is much higher than that of aluminum paint. Aluminum paint may be correctly applied as a coating to muffle and furnace casings which are indoors and where the emission of heat from such plant into the work shops causes discomfort to the operators.

Aluminum powder is used to replace silver powder in the printing trade where it has the advantage of being more economical and easier to stick onto paper.

Aluminum Metallized Paper

The manufacture of metallized paper using aluminum powder is an extensive industry, and such papers are used largely in the packing of tea, foodstuffs, and such like commodities.

Specially treated paper is used, such as sulphurized paper, and one surface is coated with an alcoholic resin solution to which the finest aluminum powder is then applied. Evaporation of the alcohol leaves the powder affixed to the paper by the resinous compound employed.

After partial evaporation of the volatile solvent has taken place the paper is subjected to some form of mechanical treatment, such as rolling or pressing to assist adhesion of the powder and impart a bright, smooth, and polished surface.

Such paper may with advantage be used in competition with some grades of tin foil. Tin foil has always been considered the safest material to employ for wrapping foodstuffs, chocolate, cheese, etc., but it must not be lost sight of that the temptation to adulterate such a high priced metal as tin by a proportion of lead is not beyond possibility, more especially as the introduction of the lead has little if any effect upon the facility with which the alloy may be rolled into the thinnest foil. Such adulteration may have serious results from the point of view of toxic properties, lead salts being mostly very poisonous.

Thin aluminum foil is now combined with paper and cardboard for book covers, wall paper, etc., and in recent times it has been found possible to combine aluminum foil with fabrics, leather, etc., which opens up almost unlimited possibilities.

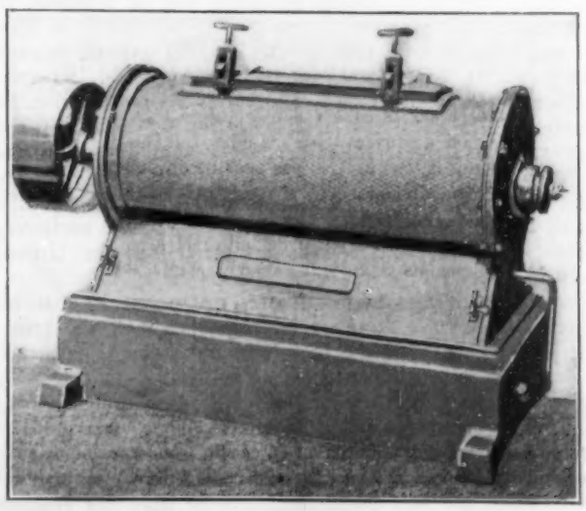


Fig. 4.—Machine for Polishing Aluminum Powder in Order to Give it Brilliance

The Recovery of Lead Storage Battery Scrap

Metallurgical and Economic Aspects of This Industry

By LESTER WILSON

National Lead Company, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE problems of recovering secondary metals, or scrap metals, are being more and more recognized as of prime economic importance. A. B. Parsons, in an excellent article, "How and Why Salvage Scrap Affects the Market for Virgin Metals," printed in "Engineering and Mining Journal" of February 18, 1928, was probably one of the first to publicly give a clear picture of the situation.

If you will consider that J. P. Dunlop of the Bureau of Mines, reports that for 1928, 308,600 tons of secondary lead were recovered in the United States, and that the production of refined lead in the United States, during a like period, from foreign and domestic ores, was 781,-171 tons, the particular importance of this secondary metal recovered in relation to the demands and uses supplied by the lead industry, is readily seen.

Of this secondary lead recovered, one of the greatest single items in point of tonnage is that obtained from old storage battery plates. Many estimates are given by experts as to the tonnage of this recovery. Probably no definite figure is available and these estimates are based on knowledge of old battery plates coming to the principal buyers, a knowledge of the statistics of automobile licenses, together with the average estimate of the life of a storage battery and an estimate of the probable percentage of the worn out batteries which find their way back into consumption.

I give as my personal opinion that not less than 95% of the worn out batteries find their way back to operators who utilize their metallic value commercially.

After due deliberation and some knowledge of all the above factors, I place the figure at between 170,000 and 180,000 tons of old batteries returned to operations which consume secondary lead. Assuming the figure to be 175,-000 tons for the year 1928, it should be borne in mind that these old storage batteries are not all metallic. On the average they contain about 77% lead and about 3% antimony, as received. These content figures may vary somewhat, but for practical purposes can be assumed to be accurate.

It will thus be seen that of the 175,000 tons of storage battery plates that come to reclamation, 134,750 tons represent metallic lead and 5,250 tons represent metallic antimony. On the basis of the figures published by the experts of the Bureau of Mines, the lead in these storage battery plates represents over 43% of the total secondary lead recovered in the United States in 1928. The 5,250 tons of antimony contained is about 33% of the antimony in ores, metal and compounds imported into the United States in 1928.

The above figures and estimates are given so that we may clearly see the commercial importance of the treatment and recovery of the metals in old storage batteries.

These old storage batteries are usually collected by service stations which replace batteries; by small itinerant junk dealers who go from house to house; and by the buyers and wreckers of old automobiles, etc. Usually, these men take the cell units with the lead connector attached, from the box container, may or may not remove the wooden separators, and sell them to middle-men or so-called dealers in secondary metals.

These dealers gather the old storage battery plates in carload lots and sell them to the various refineries at the best market price obtainable. The carloads of plates, when they arrive at the refineries, may contain, beside the worn out battery grids and lead connectors, miscellaneous pieces of rubber, sand and dirt, wooden separators, varying percentages of moisture (sometimes as high as 15%) and not infrequently material which is entirely foreign in character. The refiner takes careful weights of the shipment. Every effort is made accurately to sample the lot received. The sampling of these battery plates is rather difficult, due to the variations in moisture, wood separators, etc. in each individual old storage battery. Nevertheless, men skilled in this matter are able to resample and get very uniform results. After the final assay sample is obtained, usually by grinding fairly large amounts in a ball mill or by melting the metallics and separating the fines, the sample is assayed either by a dry fusion with soda ash and charcoal, or a wet analysis is taken. Most buyers, when buying on the wet basis of lead and antimony, deduct 1½% to approximate the dry assay.

After the plates are sampled, assayed and paid for, the refiner is ready to bring them in to some marketable form. The largest use for antimonial lead is for casting storage battery grids; namely, the frame work upon which the active lead compounds of the accumulator are pasted. Therefore, the product most usually obtained by the smelter and refiner of old storage battery plates is antimonial lead. As the plates are received and smelted they would produce an alloy of about 4% antimony and 96% lead. In some cases, new antimony is added to bring the antimonial lead to the desired percentage, or the plates are smelted in a blast furnace with antimony ore, in which case the run of the furnace approximates, in antimony, that desired for the finished product.

Besides the blast furnace smelting of these plates, some factories use the reverberatory furnace. Special rotary furnaces and electric furnaces have also been used, but with rather indifferent success.

It may be well at this point to give a brief outline of the equipment of the secondary smelter for old battery plates. If a blast furnace is used for this purpose, it is usually of the small, round type, say, 36 to 42 inches diameter at the tuyere. This blast furnace is connected to suitable dust collecting devices, either of the simple bag house type, or the more modern, mechanically shaken, stocking type. The slags produced in a blast furnace can be of a character which can be thrown away, and as a rule do not contain more than 1½% lead. In fact, total metal loss on the operation should not exceed 2% of the metal available in the storage battery plates. Altogether, the blast furnace smelting of storage battery plates in the modern secondary smelter is carried on with all the technique and chemical control which one would find in the modern lead ore smelter.

When the reverberatory furnace is used, every effort

is made to conduct the operation metallurgically so that any slag produced will be at a minimum and have the smallest possible metallic content. There are secondary smelters which produce just as cheaply from the reverberatory furnace as do others from the blast furnace. The choice of either of these types of equipment for smelting is not so much one of individual performance as of amount of material to be smelted and continuity of the operation.

Lately, the Newnam Ore Hearth has been used with some success in the smelting of storage battery plates. From a sanitary standpoint alone it is probably one of the most effective practical devices which is to be had. However, it should be borne in mind that when the Newnam Hearth is used, relatively larger quantities of dust must be collected than in either the blast or reverberatory operations. Also, a grey slag is produced which must be eventually smelted in the blast furnace. Where a plant is already equipped with a suitable blast furnace whose operation is reasonably continuous, the Newnam Hearth presents many advantages.

More and more the smelting of old storage battery plates is concentrating in the hands of those large manufacturers who have the capital to invest in modern equipment and maintain sanitary conditions such as are required by the various State Legislatures and above all, are technically skilled in the fundamentals of lead smelting. The day is past when relatively inexperienced men can smelt battery plates, allow the fumes from the furnace to go to the air and disregard slag losses. The margin on which these plates are purchased, will not allow of anything but the most effective equipment and the most skilled type of operation.

After the plates are smelted, the metal must be refined so as to meet the requirements of consumers. These requirements are exceptionally rigid, and I am of the opinion that the modern well-managed secondary smelter produces antimonial lead for storage battery requirements equal to or better than that which might be made from new lead and new antimony. This refining operation is one of skill and knowledge. It would be impossible to carry it on without chemical control.

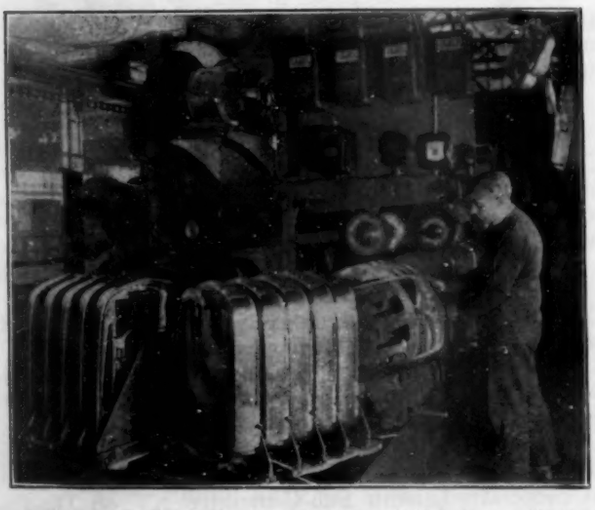
Besides the production of antimonial lead from storage battery plates, many efforts have been made to obtain the soft lead paste material contained in the grids of the old plates. From this there have been attempts to make various lead compounds, such as oxides, etc. Commercially, however, these attempts have not been fruitful. Besides the above, some manufacturers smelt the old storage battery plates and refine the resultant product to soft lead of high quality. This is accomplished by either the Parkes process or more recently, by the Harris process of lead refining.

Considering the cost of equipment, lands, buildings, laboratories, inventories of raw and finished product and necessary working capital, a very large investment would be required to build and operate the modern secondary lead smelter for the profitable treatment of scrap storage batteries.

Chrome Nickel Steel for Ford Cars

"Rustless steel," which the Ford Motor Company recently introduced in exposed metal parts of the new Fords, is a distinct innovation in the automobile industry. This alloy is of the Nirosta class 18 chromium, 8 nickel, balance low carbon iron.

Before the adoption of the alloy for use in automobiles,



Radiator Shells of Rustless Steel Are Polished to a High Brilliance Before They Are Put Into the Ford Car.

it was subjected to many severe tests by the United States Bureau of Mines, by metallurgical and other scientific institutions and by the Ford Motor Company.

The alloy, of course, is more expensive than plated metals. But the economies of mass production have made its use possible on the low-priced Ford cars. It is used in the new cowl strip, the head lamps, radiator shell, rear lamp, and the radiator, hub and gas tank caps.

White Brass

Q. I am writing to you for some advice on metal. We are manufacturing a new article for which we need a perfectly white metal, but it cannot be soft. It must have the quality of a brass.

So far we have been compelled to use yellow brass, which we have plated with cadmium, but this is too expensive and not very practical.

Can you give us a formula for producing a perfectly white brass?

A. When you say that the alloy must have the quality of brass, we assume that you cannot use white alloys consisting mainly of zinc, with smaller percentages of copper. If that is the case, some composition of nickel silver is the only thing we know of which will meet your requirements.

The following composition makes good sand castings but this type of alloy has a slight yellowish tinge:

Copper	54
Nickel	17
Zinc	27
Lead	2

The following can be cast with somewhat more difficulty, but produces a perfectly white metal:

Copper	50
Nickel	30
Zinc	20

An addition of 2 per cent of lead, to replace 2 per cent of the nickel, will improve the machining qualities of this alloy.

The nickel can best be added in the form of 50 copper-50 nickel shot, to be melted down with the copper before the zinc is added.

The same precautions should be used as when melting ordinary yellow brass.

H. M. St. John

Testing Materials Society Meeting

A Report of the Group Meetings of the American Society for Testing Materials in Detroit, Mich., March 17-21, 1930

General Account of the Meetings

THE annual Spring Group Meeting of committees of the American Society for Testing Materials was held at the Book-Cadillac Hotel in Detroit, March 17 to 21, inclusive. This plan of holding a number of committee meetings over consecutive days, which is probably unique in the activities of this Society, has worked out very successfully, conserving the time and expense of those members serving on a number of committees. The committees met throughout all the five days, starting with sessions in the morning and extending through the afternoon and evening with but one break, a dinner on Wednesday evening.

In all 23 committees of the Society took part, but with the many sub-committee meetings that were necessary the number of meetings held during these five days totalled approximately 125. About 500 were in attendance.

Special Committee Reports

The following committee reports will be of interest to the non-ferrous metal industries.

SUB-COMMITTEE II ON CAST METALS AND ALLOYS

A very well attended meeting of Sub-Committee II, of Committee B-5 on Copper and Copper Alloys, Cast and Wrought, was held at the Book-Cadillac Hotel, Thursday, March 20, in connection with the Spring Group Committee Meeting of the A. S. T. M.

A number of important matters relating to cast nonferrous metals and alloys was discussed and several recommendations agreed upon which will be brought to the attention of Committee B-5 for approval at their next meeting.

COMMITTEE B-7 ON LIGHT METALS AND ALLOYS

A well attended meeting of Committee B-7 on Light Metals and Alloys, Cast and Wrought, was held in conjunction with the Spring Group Committee Meeting of the A. S. T. M. at the Book-Cadillac Hotel in Detroit on March 18.

The chief activities of this committee centered around the preparation of proposed tentative specifications for aluminum and magnesium alloy castings. These specifications cover the various types of alloys now used in commercial work and particularly the high-strength heat-treated casting alloys sought by aviation and other industries demanding extreme lightness coupled with high strength.

These specifications will be submitted to the Society at the annual meeting in June.

RESEARCH COMMITTEE ON FATIGUE OF METALS

The research Committee on Fatigue of Metals held a meeting in conjunction with the Group Committee Meeting in Detroit on March 20, at whcih the committee decided to continue the publication of abstracts of articles dealing with the fatigue of metals, undertaken for the first time in 1929.

The work of abstracting was assigned to the several members of the committee as follows: articles appearing in the technical press and in the regular publications of the technical societies in (1) United States and Canada, (2) foreign publications in the English language and (3) foreign languages.

It is planned to include in the 1930 annual report a summary of present-day knowledge on fatigue of metals and the various topics were assigned to the several members of the committee to develop.

The question of making complete translations of articles in foreign languages was discussed and steps will be taken to determine whether the necessary funds for such translation can be made available, the committee having especially in mind two pamphlets appearing in German, of which blue-print copies can be obtained.

SUB-COMMITTEE IV, ON TIN, LEAD AND ZINC

The meeting of Sub-Committee IV, on White Metals—Tin, Lead, and Zinc, of Committee B-2 on Non-Ferrous Metals and Alloys, was held Tuesday, March 18, in conjunction with the Spring Group Committee Meeting of the American Society for Testing Materials, in Detroit at the Book-Cadillac Hotel. It was reported that at the request of the War Department, wear and other tests of some of the alloys listed in the A. S. T. M. specifications for bearing metals were under way at the U. S. Bureau of Standards, the work having been started last fall. The sub-committee will keep in touch with this work.

The future work at the Bureau was discussed and suggestions were made to include a study of the oil absorption properties of the surfaces of the various alloys. It was also suggested that a study be made of the effect of steel backing metal versus bronze backing metal in the service test on War Department trucks.

A suggestion was made to take up a study of type metals and also terne metal for coatings, and the committee will investigate what demand exists for specifications for these materials.

SUB-COMMITTEE VII ON CHEMICAL ANALYSIS

A meeting of Sub-Committee VII on Methods of Chemical Analysis, of Committee B-2 on Non-Ferrous Metals and Alloys, was held Tuesday, March 18, in conjunction with the Group Committee Meeting of the A. S. T. M. in Detroit. The meeting was augmented by a number of interested members from Sub-Committee XIV on Precious Metals and Sub-Committee XV on Die-Cast Metals and Alloys, in cooperation with which the present work of the sub-committee is being carried on.

Proposed Methods of Chemical Analysis of Silver Solders will be recommended for submission as a tentative standard of the Society.

Progress was reported on the cooperative analysis of the standard samples of zinc base die casting alloys carried on cooperatively with Sub-Committee XV on Die-Cast Alloys.

SUB-COMMITTEE XV ON DIE-CAST METALS AND ALLOYS

The Die-Casting Committee of the A. S. T. M. at its meeting on Tuesday, March 18, held in Detroit in conjunction with the Spring Group Committee Meetings, decided that its investigation of commercial die-casting alloys had progressed to a point which justified the immediate preparation of specifications. The latest lot of data covering tests of die-cast specimens included some 44 summary tables of work recently completed by the

American Brass Co. as well as recent cooperative studies carried out in the laboratories of the White Motor Co. and the Hupp Motor Car Co. This recently reported information practically completes the initial test program of the committee on twelve aluminum-base and nine zinc-base alloys covering the range of commercial compositions and involving physical and chemical studies upwards of 50,000 specimens.

Some modifications were made in the table of composition limits of the aluminum-base die-casting alloys to make the alloys coincide more closely with present practices insofar as the careful study of the committee indicated that a widening of the limits would not result in obtaining unsatisfactory die-cast parts.

The interest of the automotive industry in this investigation of die castings is constantly increasing because of the economic advantages of this process. Over 50 per cent of the total output is absorbed by the automotive industry. The adoption of the recommended specifications of this committee based upon their extensive studies will serve to make die castings more generally useful for parts, requiring strength and corrosion resistance rather than limiting their use to their early field of parts requiring simply certain sizes and shapes.

One of the outstanding developments of the committee has been to demonstrate that zinc-base die castings should be made with zinc containing only one to two hundredths of one per cent impurities to insure maximum permanence. An increase of a few hundredths of one per cent of certain detrimental impurities in the zinc used for a radiator cap might result in early disintegration in the cap whereas its life would be indefinitely extended if the committee's recommendations in respect to composition were observed.

In addition to its extensive laboratory studies of corrosion resistance, the committee is accumulating field experience by means of specimens exposed at locations at various points, having such widely varying climatic conditions as arid districts of New Mexico and humid localities such as Key West and the Panama Canal Zone. This investigation is being made possible by the enthusiastic cooperation of practically all of the large producers of die castings of the automotive industry and other large consumers such as the electric light and the telephone companies.

Abstracts of Special Papers

EVOLUTION IN AUTOMOBILE FINISHES

By M. J. Callahan

Chemical Superintendent, Chemical Products Division, E. I. du Pont de Nemours and Company

The changes that have been made in atuomobile finishes during the past decade have savored more of revolution than of evolution. All within the brief space of ten years, the basic ingredient of body finishes has been changed to one of radically different chemical nature, entirely new chemical substances have been synthesized for use in these finishes, and an altogether different technique of application has developed resulting in great economies to the automotive manufacturer, chiefly in time, in labor, and in plant space. Because they can be applied more advantageously and because they set and dry quickly, the new finishes have favorably influenced body design by making it possible to finish one kind of body about as economically as another. Perhaps most important of all, the new materials have given the car owner a more beautiful finish as well as a more durable one, and at a reduced cost.

Fender finishes and undercoats for body finishes are also discussed. In mentioning the probable further evolution of automobile finishes, it is predicted that improvements in materials for finishing fenders will likely result shortly. Although the present lacquer finish for automobile bodies appears to be thoroughly practical, it may be that the immense amount of intensive research now being done in the field of synthetic colloids will result at some future time in a product having properties equivalent to present-day cellulose nitrate lacquers but based on some other type of colloid. If an economic advantage can be obtained thereby, such a substitution will occur.

AUTOMOBILE BEARING METALS

By C. Upthegrove

Department of Chemical Engineering, University of Michigan

The first requirement of a bearing metal is that it be an alloy having at least two constituents, one hard and the other soft. Classifying bearing metals according to the principal metal that they contain, it is observed that the greater part of the bearings used in automobiles are made of tin-base and copper-base alloys.

Representative compositions for bearing metals of the principal types are given, and the effects of the metal temperature and the mold temperature at the time of casting upon internal structure are discussed. The suggestion is made that there may perhaps be an unnecessarily large number of compositions of bearing metals in use. It is suggested, also, that the securing of a standard test for bearing metals which will give results truly representative of their qualities is of great importance and worthy of a concerted effort to secure.

ADVANCES IN DIE-CAST METALS FOR AUTOMOTIVE USE

By Charles Pack

Consulting Engineer

Die casting owes both its origin and its growth to the automotive industry. Even today the automotive industry consumes more than half of all the die castings produced.

A large percentage of the die castings used in automotive construction are made from zinc-base alloys. Some of the parts made of these alloys are ornamental hardware, speedometers, gasoline pumps, carburetors, locks, instruments, radiator caps, oil filters, and the like. The alloys that are most suitable for such uses consist of a base of zinc containing small amounts of copper and aluminum, and in some instances of magnesium.

In order to prevent deterioration of die castings from growth or warping it is of the utmost importance that the purity of the metals used be controlled within narrow limits. It is not sufficient to start with pure metals. Care must be taken to insure against contamination of the alloy employed with other metals that may be used in the molds or in the die casting plant. Lead, tin, or cadmium are metals that are particularly harmful to zinc-base die castings when present as impurities. The steam test is mentioned as being the best method of making accelerated tests of zinc-base alloys.

Apart from the composition of the alloy used, the design of dies and the construction of casting machines from the viewpoints of proper gating, venting, and cooling of dies are vital factors in determining whether a given part can be made from a given alloy.

The use of tin-, lead-, aluminum-, magnesium-, and copper-base alloys for making die castings is also discussed.

British Institute of Metals

Twenty-Second Annual General Meeting Held in London, March 12th and 13th, 1930

AT the Twenty-second Annual General Meeting of the Institute of Metals held in London on March 12 and 13, 1930, the retiring President, Dr. W. Rosenhain, F.R.S., inducted the incoming President, Dr. R. Seligman, into the Chair. The Secretary presented the Report of Council for the past year.

The number of members on the roll of the Institute has increased substantially during the year. On December 31, 1929, the totals for the various classes of membership were as follows: Honorary members, 5; fellows, 9; ordinary members, 2,035; student members, 73; total, 2,122.

ELECTION OF OFFICERS

The Secretary announced that the Council for the year 1930 had been elected as follows:

President: R. Seligman.

Past Presidents: Professor Sir Harold C. H. Carpenter, Sir John Dewrance, Engineer Vice-Admiral Sir George Goodwin, W. Rosenhain, Leonard Sumner, Professor T. Turner.

Vice-Presidents: W. R. Barclay, T. Bolton, Lieut.-Col. Sir Henry Fowler, Professor D. Hanson, R. S. Hutton, Engineer Vice-Admiral R. W. Skelton.

Honorary Treasurer: John Fry.

Synopses of Papers

THE EARLY USE OF THE METALS

By Dr. T. A. Rickard

So far as possible within the limits of a single paper, a world survey is given of the early history of metals, and particularly of the non-ferrous metals. The industrial history of mankind is divisible into two major epochs—a Stone Age and a Metal Age. Between the two main epochs there was a transition period, when metals found in their native state were employed, but were not yet melted, or extracted from their ores. The melting of copper probably preceded its extraction from minerals by some centuries, and the production of bronze or hardened copper was a later stage in metal culture. The critical event in the industrial history of man was the first melting of metal out of stone, and this appears to have occurred about 3500 B. C. Metal articles fashioned at earlier periods were made from native gold, silver, or copper, or from meteoric iron. A bibliography is given, and much historical and other evidence in support of the views of the author.

THE COMPOSITION OF EUTECTICS

By Dr. D. Stockdale

The author has held the view for some time that in a binary eutectic the atoms of the two elements are present in a simple ratio. The experimental work here described was undertaken in order to get definite evidence for or against this view. Although this object has not been attained, yet the results in themselves are of interest.

A very sensitive apparatus for the taking of cooling curves is described, and a new method for the determination of the liquidus from such curves is given.

The eutectic systems examined were as follows: Aluminium-copper, antimony-silver, cadmium-tin, cadmium-zinc, copper-silver, and lead-tin.

EXPERIMENTS ON THE INFLUENCE OF GASES ON THE SOUNDNESS OF COPPER INGOTS

By N. P. Allen

The presence of hydrogen in molten copper can cause serious unsoundness in the ingots cast from it. This unsoundness has been examined, and methods for its avoidance are described.

The unsoundness found in commercial ingots is not, however, due to hydrogen alone, but to hydrogen and cuprous oxide together, which react in the solidifying metal to evolve steam. This phenomenon is very difficult to suppress, so long as cuprous oxide is present in the metal.

Those elements which, when added to copper, endow it with the ability to cast soundly, do so by reducing the cuprous oxide present.

Carbon monoxide, carbon dioxide, and nitrogen are inert, so far as the formation of blowholes is concerned.

Experimental evidence in support of these statements is given, and a method is described for studying the equilibria between hydrogen and cuprous oxide when present together in molten copper.

GASES IN COPPER AND THEIR REMOVAL

By W. E. Prytherch

In this paper are described experiments on the effect of gases, oxygen, hydrogen, and sulphur dioxide on the soundness of copper. The degree and nature of the unsoundness due to dissolved gases, have been shown to depend on the conditions of temperature, of rate of solidification, and possibly of shape of ingot obtained during casting. In the present investigation it has been found that dissolved gases may be partially removed by: (1) Slow solidification, followed by remelting of the copper; (2) passing an inert gas, such as nitrogen, into the molten metal; (3) melting in vacuo. Experiments carried out to determine whether oxygen would remove hydrogen from copper sufficed to show that the rate of oxidation of the hydrogen was so slow as to make this method unpracticable.

UNSOUNDNESS IN BRONZE CASTINGS

By E. J. Daniels

The effect of some pure gases on the soundness of bronze, and of casting in sand molds of metal subjected to various melting treatments, is described, and a tentative explanation of the cause of unsoundness occurring in practice is suggested:

(1) The observations of Karr and Rawdon, and of Carpenter and Elam, with regard to the relationship between casting temperature and unsoundness of bronzes, have been confirmed.

(2) Variations in casting temperature affect the rate of solidification, other conditions remaining constant, and similar variations in rate of solidification obtained by constant casting temperature into molds of different materials also affect the density of castings in the same way.

(3) Nitrogen, carbon dioxide, and carbon monoxide have been found neutral towards bronze.

(4) Hydrogen is capable of causing unsoundness in bronze at certain rates of solidification, and this unsoundness can be suppressed by treatment with neutral gases.

(5) It is possible that normally occurring unsoundness is due to the combined presence of hydrogen and oxygen in the molten bronze. It is different in character from that produced by hydrogen alone.

(6) Improvement in density of sand-castings can be obtained by melting in a pot-furnace with a thin fuel bed and good draught, as compared with melting in a very thick fuel bed and poor draught. With pure copper this is not so to anything like the same extent.

(7) Degasification with nitrogen, deoxidizers, and pre-solidification gave negative results so far as improvement in density is concerned, but pre-solidification appears to increase the strength of the alloy.

MACROSTRUCTURE OF CAST ALLOYS. EFFECT OF TURBULENCE DUE TO GASES

By R. Genders

Observations are described which indicate that when an alloy is cast in a mold prepared by a coating of volatile material, the macrostructure of the resulting ingot may be considerably modified by the turbulence resulting from the evolution of gases by the mold coating. The manner in which this occurs and the influence of various other factors in the casting operation are discussed.

INVESTIGATION OF THE EFFECTS OF IMPURITIES ON COPPER. Part VI.—THE EFFECT OF PHOSPHORUS ON COPPER

By D. Hanson, S. L. Archbutt and Grace W. Ford

The paper describes a systematic investigation into the properties of copper containing up to 1.48 per cent of phosphorus, in which the amount of other impurities has been kept as small as practicable. Previous published work on the subject is summarized. A series of billets of 11 alloys containing from 0.014 to 0.95 per cent phosphorus has been prepared and rolled. The investigation deals with method of preparation, macro and microstructure, hot- and cold-rolling behaviour, density, hardness, tensile tests at ordinary and elevated temperature, electrical conductivity, fatigue properties, impact strength, softening temperature of cold-worked material, determination of the solubility of phosphorus in solid copper, and age-hardening tests. The tests relate principally to rolled material.

Phosphorus removes oxygen from copper and improves its casting properties. Small amounts of oxygen can be found together with phosphorus in copper, depending on the amount of phosphorus present. Removal of oxygen by phosphorus improves the cold-working qualities of copper. Copper containing up to 0.95-1.2 per cent phosphorus can be hot-rolled, and up to 0.79-0.95 per cent cold-rolled from cast billet. Phosphorus improves all those mechanical properties of copper which have been studied, and raises the softening temperature of cold-worked material. It is seriously detrimental to electrical conductivity, which may be attributed to the fact that it is markedly soluble in solid copper. The wrought alloys of higher phosphorus content exhibit a small amount of age-hardening after suitable heat-treatment.

THE ALUMINIUM-BRASSES

By R. Genders

The work described comprises a study of the properties of the ductile aluminium-zinc-copper alloys. It is shown that, over certain ranges of composition, the presence of aluminium in brass has a beneficial influence in several directions, especially as regards resistance to corrosion and to oxidation at high temperatures. The composition of the alloys can be adjusted to give a wide range of mechanical properties.

THE DIFFUSION OF ZINC IN COPPER CRYSTALS

By C. F. Elam

Some experiments are described which were made with the object of seeing if zinc would diffuse into copper crystals. This only took place to a limited extent at high temperatures. The method was further extended to brass crystals of different composition, and it was found that if a β brass crystal was heated in zinc vapor, a layer of γ was deposited which was also a crystal. The relationship between the two crystals was found to be sometimes parallel growth and sometimes a twin. The diffusion of zinc out of a brass crystal was also studied.

PROTECTIVE VALUE OF SOME ELECTRO-DEPOSITED COATINGS

By L. Davies and L. Wright

The work outlined represents investigations carried out during the year 1929 on a large number of specimens of steel, brass, phosphor-bronze, and copper. The specimens were plated with cadmium, zinc, nickel, and chromium of thicknesses 0.0001 in., 0.0005 in., 0.001 in., and 0.002 in., and were subsequently exposed to accelerated corrosion tests. The paper is concerned with the production of deposits of a thickness frequently specified or recommended, and with their comparative behaviour to corrosion sprays of salt and sulphuric acid.

Under the conditions outlined, cadmium afforded better protection than zinc against the sulphuric acid spray. Against the salt spray, the thinnest deposits of zinc gave better protection than the corresponding cadmium deposits. In general, for equal thicknesses of zinc and cadmium, the intrinsic protection afforded by the zinc more than compensates for its higher solution potential. Chromium deposits afforded no protection whatever to steel, but very good protection was afforded to the non-ferrous basic metals. A deposit of 0.002 in. nickel was found necessary to give any degree of permanent protection to steel. For general purposes, nickel deposits appear to be most suitable, but no deposit can be recommended unless the service conditions are known.

A NOTE ON ZINC-BASE DIE-CASTING ALLOYS

By R. Lancaster and J. G. Berry

The effect of adding small quantities of magnesium to a zinc-base alloy, hardened with copper and aluminium, has been examined. There is a variation in the physical properties, and a distinct change in the crystalline structure, with successive small additions of magnesium.

ATMOSPHERIC ACTION IN RELATION TO FATIGUE IN LEAD

By Bernard P. Haigh and Brinley Jones

The paper gives a detailed account of a number of fatigue tests carried out under abnormal conditions that were specially devised to study the action of air in relation to fatigue in lead, it being believed that this action is representative of chemical and mechanical action.

It is shown that an oil-bath round the test-piece, or even a water-bath, greatly delays fatigue in lead, and that a thin layer of grease delays fatigue appreciably. A bath of acetic acid appears to eliminate fatigue in lead, although a thin film of the same acid does not do so.

It is shown that the fatigue fracture of lead is intercrystalline only round the margin, and that, in general, the interior surface of a fatigue fracture differs in character from the marginal zone.

The experiments are regarded as showing that oxygen diffuses through lead subject to cyclic stress, and that, at an appreciable depth below the surface, it provokes a conjoint chemical and mechanical action that leads to fatigue cracking.

A NOTE ON METALLIC MAGNESIUM

By W. R. D. Jones

A comparison of redistilled magnesium of 99.99 per cent magnesium and ordinary commercial magnesium. The redistilled magnesium is obtainable at such a reasonable price, in view of its purity, that it can be used in metallographic researches.

Sprayed Molten Cadmium Coatings in Gasoline Storage Tanks

Sprayed Molten Cadmium Coatings Were Found to Be Far Superior to Sprayed Molten Zinc Coatings, Although the Latter Will Protect the Steel Against Rust

By LEOPOLD PESSEL

Metals Coating Company of America, Philadelphia, Pa.

REPRINTED FROM INDUSTRIAL AND ENGINEERING CHEMISTRY, FEBRUARY, 1930

IN conjunction with extensive tests regarding the corrosion resistance of sprayed molten metal coatings, the question of protecting the inside of steel tanks for storage of liquid fuels was investigated. This problem has always presented considerable difficulties, as protective coatings of a non-metallic nature are quickly destroyed, as a rule, by the solvent action of the stored liquids, and metallic protective coatings have not previously shown much promise in regard to corrosion resistance (2, 6).* The metal-spraying process offers the possibility of applying practically any metal in a sprayed molten form on practically any surface. This provides the opportunity to investigate the value of metals that are more or less difficult to apply on large objects in form of protective coatings (1, 3, 4, 5).* This article will deal with the advantages obtained by the application of sprayed molten cadmium coatings on tank steel exposed to gasoline.

It has been shown in many cases that as a protective coating cadmium possesses distinct advantages over zinc. Cadmium stands closer to iron in the electrochemical series and will not, therefore, deteriorate so quickly as zinc on account of anodic attack. At the same time it is still anodic toward iron and will protect in accordance with well-established electrochemical principles. Cadmium is also far more resistant to the attack by acids than zinc, it is not so readily oxidized by contact with the atmosphere, and it is far more resistant to the attack of chlorides. For these reasons it was decided to compare the protective value of sprayed molten cadmium coatings with that of sprayed molten zinc coatings, both applied on steel and exposed to the action of gasoline. As zinc is much cheaper than cadmium, it seemed of practical interest to arrive at some comparative conclusion regarding the relative economy of the two metals under these specific conditions.

As there can be little doubt that the presence of moisture in gasoline is esential for the progress of corrosion, together with other factors, such as sulfur content, presence of salts, oxygen, etc., it was decided to accelerate the corrosion by having present considerable amounts of water or sea water, and also to determine the corrosiveness of a gasoline containing considerable quantities of free sulfur. The behavior of a gasoline containing an organic lead compound as a knock preventive was also investigated, as there was the possibility that the presence of a cathodic metal such as lead, even in traces, might influence the rate of corrosion attack. Acceleration was provided by keeping the mixtures of gasoline and water saturated with air by bubbling it through the liquids at frequent and regular intervals.

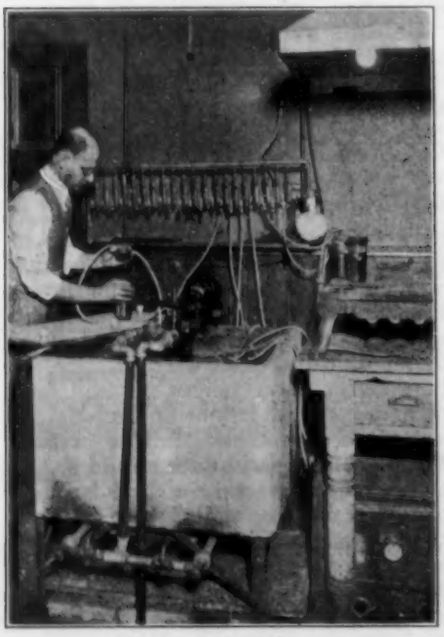


Figure 1 Corrosion-Testing Equipment Used for Aerating Gasoline-Water Mixtures and Test Plates

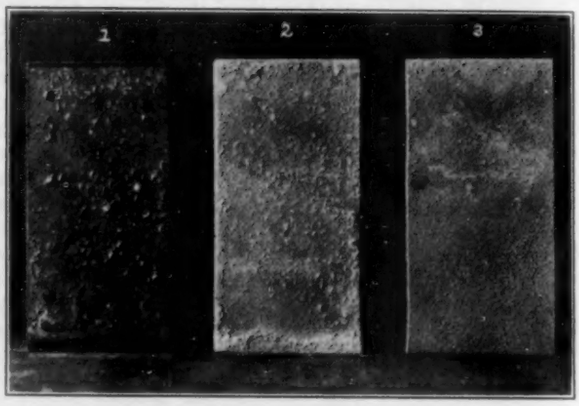


Figure 2—Series 1. Mixture of High-Sulfur Gasoline and Distilled Water (See Figure 6)

Experimental Procedure

Four series of tests were made, using the following liquids as corrosive media:

Series 1. Ordinary gasoline (sp. gr. 0.742), 135 cc., was shaken with 0.5 gram of powdered sulfur in a separatory funnel and 15 cc. of distilled water were added. The excess of undissolved sulfur was not removed.

Series 2. To 135 cc. of the same brand of gasoline were added 15 cc. of sea water from the Gulf of Mexico (sp. gr. 1.03).

Series 3. To 135 cc. of the same brand of gasoline were added 15 cc. of distilled water.

* See list of literature cited at end of this article.

Series 4. To 135 cc. of a commercial gasoline containing an organic lead compound as a knock preventive (sp. gr. 0.746) were added 15 cc. of distilled water.

The test specimens were sawed from blue annealed tank steel plates, ⅛ inch (3 mm.) thick, of the following analysis: carbon 0.13, manganese 0.6, sulfur 0.05, phosphorus 0.05 per cent. The mill scale was removed by blasting with angular hardened steel grit. Sprayed molten zinc and cadmium coatings were applied by means of a Metalayer metal spraying machine (1, 4). The thickness of these coatings averaged 0.007 inch (0.1478 mm.). Three test specimens were exposed individually in each of the gasoline-water mixtures above described—one plate sprayed with cadmium, one plate sprayed with zinc, and one plate without any coating whatever.

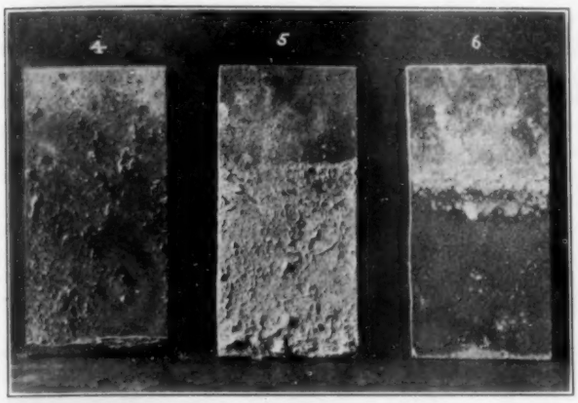


Figure 3—Series 2. Mixture of Ordinary Gasoline and Sea Water (See Figure 6)

The arrangement of the testing apparatus is shown in Figure 1. The test specimens were individually immersed in the gasolines inside of Pyrex beakers of approximately 400 cc. capacity, so-called "dye pots." These beakers were closed by rubber stoppers provided with two holes through which passed bent glass tubes that served as inlets and outlets for the air. These glass tubes extended below the water line at the bottom of the beakers. The gasoline-water mixtures covered approximately two-thirds of the test specimens. About one-third remained exposed to the air-gasoline-water vapors above the liquid level.

The air used for the aeration came from an air compressor. The pressure was regulated by a needle valve and the air was first washed by bubbling in through a 10 per cent solution of sodium hydroxide in water and then filtered through cotton. Subsequently it passed into a glass manifold and through a small amount of very pure mineral oil (medicinal oil), which served as bubble indicator to make the passage of air through the individual beakers visible. From there the air entered the glass beakers through rubber hose connections and glass tubing.

These tests were made at room temperature (approximatel 20° C.). Figure 1 shows a constant-temperature bath which was used in similar tests, to be described later, which were made at higher temperatures. It was constructed of thick copper sheet, heavily insulated with asbestos, heated by gas burners, and provided with a thermostat and stirring mechanism. It contained copper racks to accommodate immersed test jars and beakers.

During the testing period the liquids were aerated daily for one minute. The air was introduced into the water layer at the bottom with sufficient force to lift up small drops of water into the gasoline. The gasoline therefore could be considered as being saturated with both air and water. As the side of the test specimens facing the air inlet was obviously more exposed to corrosion than the other side, the plates were turned around daily. After a period of 60 days the test specimens were removed from the liquids, dried in the air, and photographed. (Figures 2 to 5) The remaining liquids were filtered through paper filters, the residue washed with water, the filters with contents ignited, and the ash weighed. While the weight of this ash is not absolutely identical with the amount of sludge from which it has been derived, it permits a comparison of the corrosiveness of the various gasoline-water mixtures and indicates the tendency for sludge formation of the metal coatings. Figure 6 gives the weights and a photographic view of the ignited sediments.

Discussion of Results

Although the severest corrosion attack occurred just below the water-gasoline boundary line near the bottom of the beakers, the plates showed, generally speaking, a rather uniform distribution of corrosion.

The unprotected steel plates showed severe corrosion in all cases, although in series 3, plate 7, there seemed to be less tendency toward pit formation than in the other corresponding plates. The amount of sludge from these uncoated plates was very considerable, which confirms the practical experience gained on tanks in service.

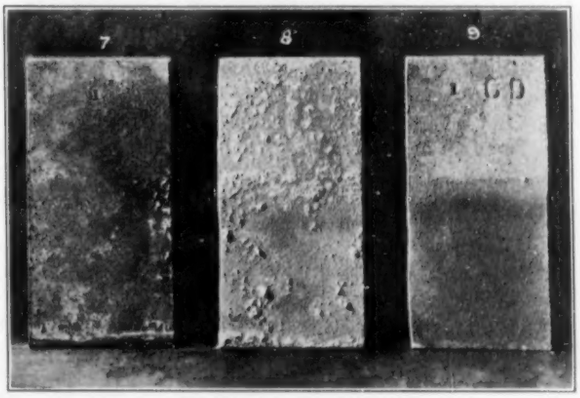


Figure 4—Series 3. Mixture of Ordinary Gasoline and Distilled Water (See Figure 6)

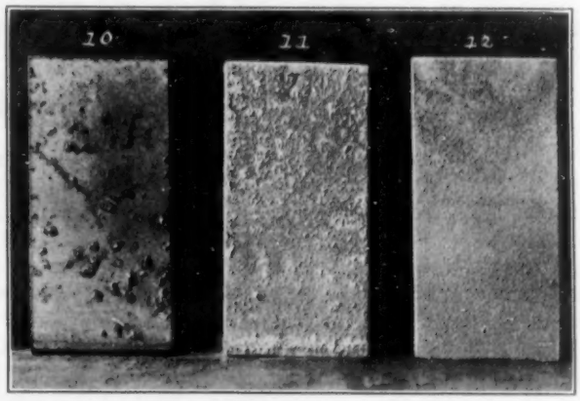


Figure 5—Series 4. Mixture of Gasoline Containing Organic Lead Compound and Distilled Water (See Figure 6)

The zinc-coated specimens showed considerable attack of the zinc layer, but no rusting or pitting of the steel. While sprayed molten zinc coatings have great value in protecting steel against corrosion, their use in this case seems inadvisable if the formation of sludge has to be reduced to a minimum. They yielded considerable amounts of sludge.

The cadmium-coated test plates showed slight signs of attack only in series 2 (sea water). The amount of sludge was correspondingly higher in this case. All the other cadmium-coated plates showed practically no sign of deterioration and the amount of sludge was uniformly insignificant. (The slightly rough appearance of the specimens

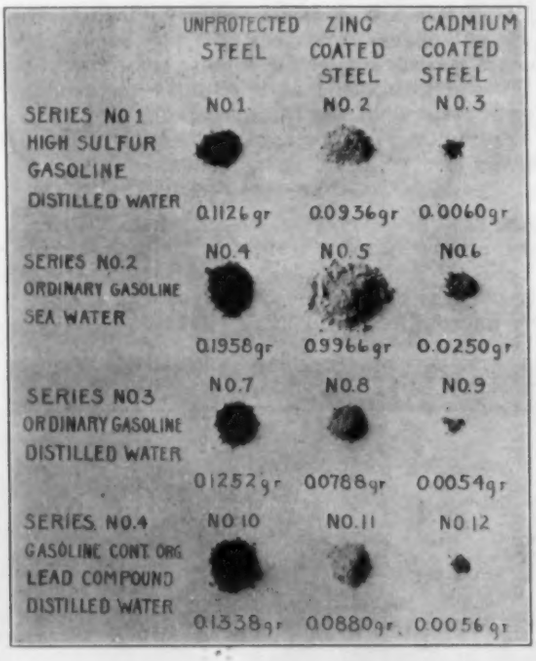


Figure 6—Weights and Photographic View of Ignited Sediments (Compare with Figures 2, 3, 4, and 5)

is due to the roughness of the grit-blasted steel surface on which the cadmium was sprayed.)

Comparison of series 3 and 4 in Figure 6 indicates plainly that the gasoline with the organic lead compound, added as a knock preventive, is more corrosive than ordinary gasoline. No explanation can be offered here for this, except the possibility that a small amount of the lead compound is reduced to metallic lead and forms cathodic areas which cause the formation of local pits.

The gasoline-sea water mixture (series 2) is far more corrosive than any of the other combinations under test.

Conclusions

These tests indicate that sprayed molten cadmium coatings will protect steel tanks for the storage of gasoline against corrosion and will practically prevent the formation of bottom sludge even under very severe corroding conditions. Cadmium is a relatively expensive metal, its price being about ten times as high as that of zinc. This factor is important for the economic aspects of the application of this metal in a sprayed molten form. In other respects it is not so expensive to spray cadmium as it is to spray zinc. It is interesting therefore, to note that in a gasoline-sea water mixture the amount of sludge derived from the zinc coating is forty times as great as that from the cadmium coating. With the other gasoline-water mixtures, the ratio on an average is 15 to 1. This would make the application of cadmium profitable in spite of its price. A commercial gasoline containing an organic lead compound added as a knock preventive proved to be more corrosive than ordinary gasoline. But also in this case the sprayed molten cadmium coating afforded very efficient protection. The amount of bottom sludge was insignificant, and practically no larger than in ordinary gasoline.

Literature Cited

(1) Binder, Machinery, 1927.

(2) Dietrich, Korrosion, Metallschutz, 5 (1929).

(3) Rawdon, "Protective Metallic Coatings," Chemical Catalog, 1928.

(4) Roberts, Compressed Air Magazine, 32, 11 (1927).

(5) Turner and Budgen, "Metal Spraying," Lippincott, 1926.

(6) Wawrziniok, Auto Tech., 1927.

Thickness of Cadmium Plate

Q. One of our customers would like to know the amount of thickness required in cadmium plating steel pieces. This work is to be used by an electrical contractor and some of it is exposed to the elements. He has an idea that one-half thousandth of an inch is the necessary plate, while we claim two ten-thousandths is standard for this work.

Will you kindly tell us immediately the thickness usually required for this type of work, so that we may show our customer your reply.

A. The thickness of the deposit of any protective metal, such as cadmium or zinc, for example, required upon any article will depend upon where the article is to be exposed and how long a time its life must be protected. The rate of corrosion is not the same in all parts of this country and it is well to put sufficient metal on to protect the base metal under the average condition. That will have to be ascertained by actual test.

It is not possible to state definitely what the thickness of the protective coating should be. In general, it has been claimed that .0002 inch of cadmium is equivalent to .001 inch of zinc.

We know of no reliable data that has been published on this. The U. S. Bureau of Standards is now conducting a research on the protective value of electrodeposited coatings. ELECTROCHEMICAL ENGINEER

Investigation of Anodes for Production of Electrolytic Zinc*

By H. R. HANLEY, C. Y. CLAYTON AND D. F. WALSH

There were 28 lead alloy anodes tested in respect of passivity and anode potential. Outside of the silver-lead anode devised by U. C. Tainton, the only series that showed outstanding characteristics were those containing calcium lead, and thallium lead. The calcium lead anode exhibited remarkable lowering of the anode potential, amounting to approximately 50 per cent. below the potential of pure lead. This alloy did not exhibit passivity better than pure lead, but it became passive when 1 per cent. silver was added. Then it became equal to the silver lead in this respect, with the enhanced value of greater lowering of the anode potential than any other anode tested. Thallium over 4 per cent. was shown to exhibit remarkable passivity but with very little lowering in the anode potential. The influence of manganese on stabilization of alloyed anodes was also determined.

* A paper read at the meeting of the Institute of Metals Division in New York, February 17-20, 1930.

Cleaning Aluminum

A Method of Testing Aluminum Cleaners

By R. W. MITCHELL, Ph. D.

Technical Director, Magnus Chemical Company, Inc., Garwood, N. J.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE widespread use of aluminum and its alloys in all branches of industry has made the cleaning of these metals a subject necessitating special study. For, due to its amphoteric nature, aluminum and its alloys are so sensitive to alkaline solutions that washing with the ordinary run of detergents will cause rapid attack or corrosion. At the boiling point an aqueous solution of pH 10 will cause attack, solution of the metal and evolution of hydrogen resulting.

$$2Al + 6OH^- = 3H_2 + 2AlO^{-3}$$

or written another way,

$$2\ Al + 4\ H_2O = 3H_2 + 2\ H{\cdot}AlO_2$$

pH 10 is no more than the alkaline strength of many soap solutions. In using sodas and alkaline cleaners, much more highly alkaline solutions are encountered, the values for metal cleaning compounds running commonly up to pH 12.5. Under these conditions rapid attack takes place; polished aluminum darkens and loses its luster, castings become etched and pitted, often turning black (due to alloyed metals), and machined parts lose their true dimensions.

Aluminum is one of the most difficult metals to clean. In addition to its susceptibility to attack by alkaline solutions, the metal—particularly when cast—is usually porous. This means that dirt is held tenaciously, and complete rinsing is difficult. Many aluminum alloys contain some metal electro-negative to aluminum, as copper, iron, nickel, etc. Segregation produces excellent opportunity for galvanic action, which shows itself by pitting and hydrogen evolution. In alloys containing silicon attack also occurs. Silicon and silicides dissolve readily in hot alkaline solutions.

$Si + 2H_2O = SiO_2 + 2H_2$ (SiO_2 forms a hydrated ppt.)

Soluble silicates or chromates have been found useful for preventing corrosion of aluminum. Their presence in an alkaline solution has an inhibiting action on the chemical reactions given above. This effect is due to the formation of a thin layer (probably only of molecular thickness) of insoluble aluminum silicate over the metal in the one case, and the deposition of what some have stated to be a similar thin layer of insoluble chromate in the other. There is another possibility in the second case as shown by the following reaction.

$$Al + CrO^{-4} = AlO^{-2} + CrO^{-2}$$

This could result in an insoluble chromite being formed or possibly a chromic aluminate, for chromic hydroxide would be present in equilibrium with the chromite ion shown above.

$$CrO^{-2} + 2H_2O = Cr(OH)_3 + OH^-$$

Tests made by boiling aluminum in alkaline solutions containing chromate ion show a slow reduction of chromate concentration. A flocculent dark green precipitate forms.

Chromic ion forms numerous complex ions, with water, ammonia, cyanide, etc. $[Cr\ (H_2O)_6]^{+++}$ is known and is found largely in dilute chromic ion solutions. It may be that this ion has adsorptive and covering properties giving protective properties. This is the only explanation occurring to the writer to explain any different action from that obtained with other radicals forming insoluble aluminum compounds, as say, phosphate. Aluminum phosphate is exceedingly insoluble. Yet a solution (either dilute or concentrated) of trisodium phosphate quickly dissolves aluminum.

A $\frac{N}{10}$ solution of sodium chromate added to a clear solution containing sodium aluminate, and of pH 11 produced no precipitate after boiling five minutes and allowing to stand thirty minutes.

A piece of aluminum foil was added and the solution brought to 200° F. Gas evolution commenced and in thirty minutes an abundant dark green flocculent precipitate had formed.

In strongly alkaline solutions I have not found chromates effective, and in general I would say their effect is to retard rather than inhibit chemical action on aluminum. On zinc or tin, chromate is much more effective.

Sodium silicate may be any one of a number of compounds. Silicon forms a very large number of complex silicic acids, the salts of which may be mono, di, tri, or tetra, silicates of the ortho, meta, meso, or para acids. In commercial sodium silicates the ratio of base to acid (Na_2O to SiO_2) may range from 1 to 1, to 1 to 4. The amount and kind of silicate added to an alkaline cleaning solution is important. The more alkaline silicates do not protect well (a polysilicate forms a better film). Those too high in silica form too heavy a film, do not rinse well, and leave a white deposit visible upon the work when it is dry. Such a deposit not only spoils the appearance but in the case of a machined part might ruin its action. For instance, a piston might have its surface so altered that it would "seize." Silicates should not be used alone, but always in conjunction with some alkaline salt such as borate or phosphate which will improve rinsibility. Caustic soda solutions should never be used for cleaning aluminum for this material rinses poorly and is always adsorbed in considerable amount on an aluminum surface.

The writer has developed a test for determining the suitability of aluminum cleaners. Its use will quickly eliminate unsafe materials. This test is based upon the insertion of a test piece of metal into a solution, under an inverted test tube. The amount of evolved gas collected is a measure of the corrosion.

Sample pieces of the aluminum metal or alloy are cut of such size as will readily fit into a six inch test tube. A piece one to two inches long and about ¼ inch wide is suitable. The various cleaning materials to be tested are dissolved in beakers (about 250 c.c.) and calibrated test tubes (six inch) are filled with the respective solutions

and placed in the full beaker in an inverted position. (See Fig. A.)

The solution is then brought to a boil. Roughly quantitative results are then obtainable by measuring the volumes of gas evolved after the test pieces are inserted. Where this is sufficient, omit the weighings in the following:

For an exact quantitative determination, clean with benzene or ether, wipe and weigh the test pieces of metal to tenths of a milligram and with forceps or tongs (crucible tongs are convenient) quickly insert a metal strip inside the base of each test tube. Place the beakers in a water or steam bath and keep at 200° F. for a given

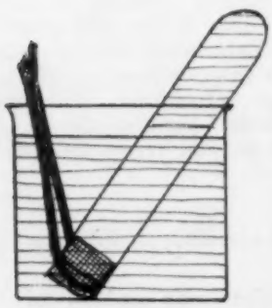


Fig. A—Rubber Stopper Is Removed by Tongs After Test Tube Is Submerged. This Is a Convenient Method. Be Sure There Are No Air Bubbles in the Tube

period (say 15 minutes). At the end of this time measure the volume of gas evolved, remove the pieces, rinse in some standard manner (paralleling production practice) dry, and weigh. The tests will appear as follows: (see Figs. 1, 2 and 3.)

Following are data on three samples tested by the writer:

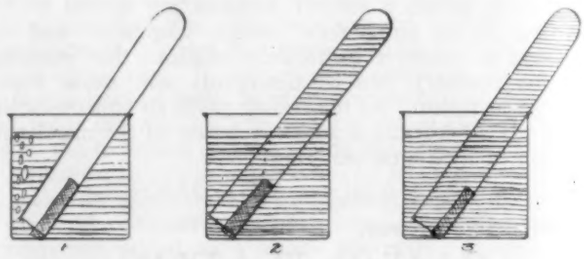
Cleaner sample	pH of 4% solution	Weight change	Mgs. per sq. in.	gas. vol.
No. 1	12.2	.0189 loss	25	over 20 c.c.
No. 2	11.4	.0013 gain	1.7	2½ c.c.
No. 3	12.0	none	none	¼ c.c.

It is important to have the test pieces uniform; they should all be cut from same section of one piece of stock. Above samples were cut from sheet aluminum and had dimensions of ¾" x 1½".

Sample No. 1 was badly corroded and discolored; it had lost 18.9 milligrams. Sample No. 2 was not corroded but had a tenacious white film, which would not rinse off and rubbed off only with difficulty; it gained 1.3 milligrams. Sample No. 3 had not changed in appearance; it had not changed weight, nor had it evolved gas, indicating a satisfactory test.

There will be a certain small volume of gas evolved even where there is no attack. This is the air held in the surface of the test piece. Its volume will vary with the porosity of the sample, but will generally be only a fraction of one c.c.

A specification for a suitable material for cleaning aluminum without attack would read:—The solution in concentrations from two to six percent by weight should not evolve more than 2 c.c. of gas, nor dissolve more than one milligram of metal per square inch of surface at 200 to 210° F. The material should rinse freely leaving no visible deposit, and the sample should not gain weight. Materials which will meet these specifications and also remove the various types of shop dirt, oil, etc., are available



Plain Alkali. Action Pronounced. Hydrogen Has Completely Displaced Solution. Continual Rapid Solution of Metal.

Cleaner Whose Action Partially Inhibits Corrosion. Rate of Attack Very Slow.

Action Completely Inhibited. Complete Protection.

from manufacturers who have made proper study of this proposition.

The effectiveness of the cleaner for removing different types of dirt, such as polishing compound, mineral oil, grease, etc., must of course be determined by other suitable tests. The test just given will, however, at the outset eliminate all those materials which are unsafe to use. The writer has encountered a few special alloys where in casting segregation has occurred giving a metal of such pronounced tendency to galvanic action that materials ordinarily effective would not work, or behaved irregularly. Such cases are rare exceptions, however, and two years' experience in using this test has been quite satisfactory.

In cleaning aluminum it is desirable that the temperature of the solution be not maintained above 210° F; 200° F. is better. Even with a solution of good inhibiting action, vigorous boiling is apt to cause corrosion and gas evolution, where at 10° lower there will be absolutely no action. This method of testing the action of cleaners upon aluminum may also be applied to zinc and its alloys, as die casting metal, or magnesium alloys.

Retinning Automobile Radiators

Q.—I have repaired something like 8,000 automobile radiators in the past eleven years and my rejections until the past year have been less than 2 per cent. This indicates my experience.

I have a pouring or retinning outfit and I have retinned about 2,000 of the radiators mentioned above. During the past year, however, only about one in ten that I have retinned has been successful. I have compared notes with two other radiator repair firms here and they report much the same trouble. It seems to be impossible to clean the radiator before pouring on the solder. I have tried fresh muriatic acid raw, then flux. I have tried soldering salts. And when it is necessary to kill a tube I find that it is almost impossible to make the solder stick.

I have come to the conclusion that it is the fault of the anti-freeze mixtures used in the radiators, especially the glycerine compounds and other new mixtures now on the market. The only cleaner I have discovered thus far that will do the job at all is hydrofluoric acid, which is too expensive and consequently not to be considered for general use.

I would appreciate your advice in this matter.

A.—Use a mixture of 100 parts concentrated sulphuric acid (66 deg. Baumé) and 75 parts nitric acid (36 deg. Baumé). This should clean thoroughly all parts where this mixture or dip is applied. —P. W. Blair.

Commercial Electroplating on Aluminum

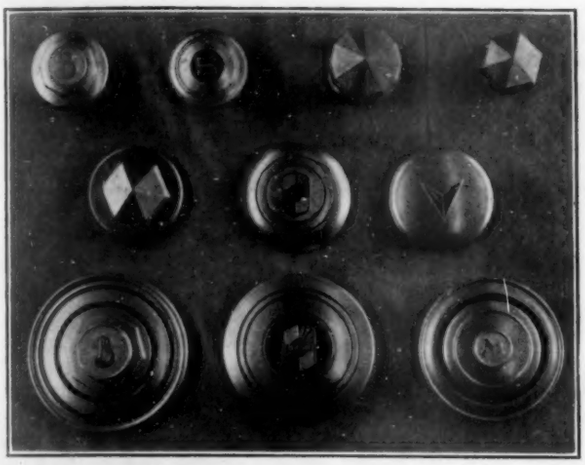
How the Electroplating of Aluminum Is Spreading

By HAROLD K. WORK

Aluminum Research Laboratories, Aluminum Company of America, Buffalo, N. Y.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

ALTHOUGH many and varied chemical processes have been developed to coat aluminum articles, methods of electroplating aluminum with other metals have, with but a few exceptions, failed to develop commercially. Three years ago aluminum was electroplated in a laboratory research study[1]; and during the past two years, the demand for plated aluminum has been so extensive that this laboratory method has grown into a successful commercial process.

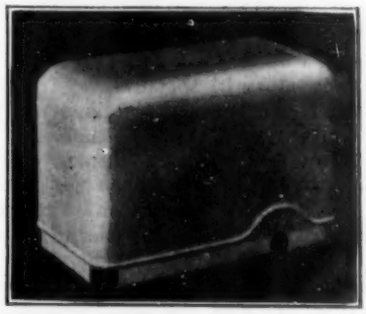


Plated Hub Caps of Aluminum

Although aluminum in contact with many chemicals needs no protective plating of another metal, there is a general demand for aluminum parts plated with chromium, nickel or copper, to match the color of adjacent non-aluminum parts similarly plated. The company which pioneered in the production of plated aluminum parts on a large scale was first induced to install plating equipment to meet the demand of automobile manufacturers for an aluminum hub cap that would match plated car fittings in color. Aluminum caps are light in weight, and can be produced economically in this ductile and easily fabricated metal, it is true; but it became evident that regardless of their advantages, unplated aluminum caps were going to be displaced except where close color matching of metal trimmings was not essential, and on cars employing aluminum for all bright work.

Plated Aluminum Percolator

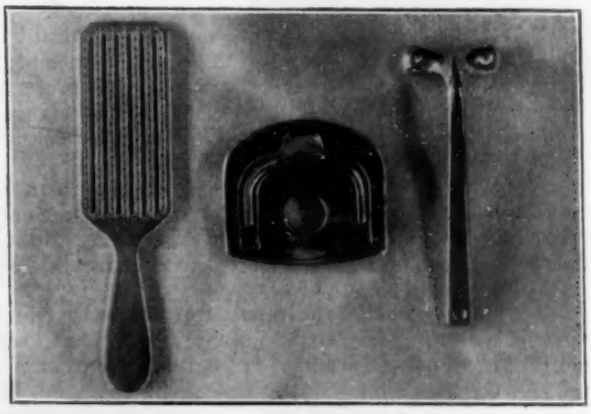
While the hub cap contributed the first and by far the largest business in this field, numerous other aluminum products have been plated successfully. A combination percolator and toaster, for example, is produced with a nickel-plated aluminum percolator shell and drawer front.



A Radio Shield of Aluminum, Zinc Plated Along the Lower Edge at the Line of Contact Between the Shield and the Chassis

The manufacturer of this electrical specialty has incorporated aluminum with other metals but has obtained the desired uniformity of a nickel plated finish for all bright parts. Many thousands of this service table or breakfast room accessory have been produced, marking the beginning of a move to bring aluminum out of the kitchen and into the dining room.

Brass, oxidized and antique copper or bronze finishes in addition to nickel and chromium will carry aluminum throughout the house. Plating aluminum to match other metals will rapidly expand in many avenues the uses of this light and easily worked metal. The natural color of aluminum often supplies a pleasing contrast with dark metals; but with white metal finishes such as nickel or



Plated Aluminum Die Castings

[1] Trans. of Am. Electrochem. Soc. 53, 361-387 (1928); also THE METAL INDUSTRY, June, 1928, pp. 261-263; July, 1928, pp. 313-315.

chromium, the effect is unfortunate, suggesting careless manufacture.

Aluminum bass and snare drums for bands and orchestras have been chromium plated with entire success, as have smaller parts of a miscellaneous nature. Plated aluminum trays for cafeterias, whose cleaning routine does not thoroughly remove all traces of grease from aluminum, are being tested at the present time. Zinc plating has proven entirely successful on aluminum. For one manufacturer, several hundred thousand aluminum radio shields have been plated with zinc along the lower edge to effect a certain type of joint between the shields and chassis.

The plating of sand castings has not been carried on to any great extent because most aluminum sand castings are intended for service where plating is of no advantage. On the other hand, aluminum die castings have been plated extensively. Lots of several thousand each of plated beauty appliances, hair brushes and automobile door handles have been plated, as well as waffle irons and washing machine agitators.

Even a casual survey of these recent developments indicates the tremendous potential opportunities for plated aluminum. Hub caps constitute only a small fraction of automobile hardware: lamps, radiator shells and caps, gasoline tank caps, door handles, steering wheel spiders, cowl bands, running board moulding and interior trim in general can often be manufactured of plated aluminum at a saving in cost. Washing machine companies already have exhibited interest in plating various parts of their machines, and household equipment provides another field for this type of work.

Hanson - Van Winkle - Munning Company Change

THE METAL INDUSTRY for January, 1930, gave the story of the proposed changes which were contemplated in the management and personnel of the Hanson-Van Winkle-Munning Company. At that time many rumors were abroad, and it was decided to get authoritative data, which was published in the above issue.

We are now in a position to state that the contract then referred to, between the Hanson-Van Winkle-Munning Company, V. W. Todd, and A. P. Munning and his associates, has been consummated as of March 1, 1930. Mr. Munning and his associates in the old A. P. Munning Company have sold all of their common stock to the Hanson-Van Winkle-Munning Company, per se, which will retire this common stock, and also to Mr. Todd and some of his associates. Mr. Todd, in turn, has resold a large amount of the stock which he purchased, to employees of the company.

A. P. Munning
Retiring Chairman of the Board

All of the above common stock was sold for practically 50 per cent cash and 50 per cent preferred stock of the Hanson-Van Winkle-Munning Company.

A new Board of Directors was elected, which consists of: Van Winkle Todd, C. W. Yerger, George Smith, H. L. Zucker, Nelson Todd, Guerin Todd, E. N. Boice, Rupert G. Bruce, E. L. Boots, Julian A. Gregory and A. P. Munning.

Mr. Munning and Mr. Gregory are retaining directorships until the preferred stock which has been given to them in part exchange for some of their common stock, has been paid for and retired by the company. Mr. Munning retains none of the common stock, having sold out his common stock interests completely.

The office of the Chairman of the Board of the Company was declared vacant and will not be filled. The officers of the company, elected at the annual meeting, were:

V. W. Todd, President; C. W. Yerger, George Smith, H. L. Zucker, Vice-Presidents; Nelson Todd, Secretary; E. N. Boice, Treasurer.

Everyone connected with this transaction is very much pleased with the happy ending of the negotiations, and every one of the old Munning stockholders wishes the company a very happy and prosperous future.

The retirement of A. P. Munning from the company caused a great deal of regret among all of the stockholders, but, as he pointed out to them, their company was never in better shape; they were the largest organization, with the best resources and largest factory space, in the country; they had built up an organization which was almost unassailable, and would continue to exercise the greatest sphere of influence in this industry, due to their prestige, size, fair business methods, research work and service; they had no bonds, mortgages, or bank loans, or any other obligations outstanding.

Van Winkle Todd
President of the Company

He sincerely wished them a continuance of the business on the same plane on which he had built it up. He stressed particularly the question of ethics and fairness, not only to customers and consumers, but also to competitors, and felt certain that with continued co-operation, and particularly now, with the large employee ownership, the company would have a bright and prosperous future.

Electroplating Abstracts

By DR. A. K. GRAHAM

Associate Editor

THE EFEFCT OF ADDITION AGENTS UPON THE CONDUCTIVITY, CATHODIC POLARIZATION AND GRAIN SIZE OF DEPOSITS OBTAINED FROM THE CELL: $Cu/CuSO_4$, H_2SO_4/Cu.

By B. CLARK AND E. O. JONES

Transactions of the Faraday Society, No. 102, Vol. XXV, November, 1929

"FROM a study of the published researches of various workers the following generalizations, whilst not universally applicable can be regarded as holding for most cases of metal deposition.

"(a) **Nature of Electrolyte.** The deposit obtained from a solution containing complex ions is generally of finer grain than that from a solution in which the metal exists wholly as simple ions.

"(b) **Conductivity.** The use of solutions of high conductivity is advantageous as, other things being equal, it results in a reduced voltage drop across the plating vat and a reduced tendency towards treeing of the deposit.

"(c) **Concentration of Electrolyte.** A high concentration of metal ion is usually desirable.

"(d) **Current Density.** Fineness of grain increases with current density until a critical current density is reached, above which the metal tends to be deposited in a powdery, non-adherent form.

"(e) **Rotation of Cathode.** Rotation of the cathode enables the current density to be increased considerably. The critical current density, referred to under (d) increases with increasing rate of rotation.

"(f) **Agitation of Solution.** Agitation of the solution results in the formation of finer grained deposits and allows the use of higher current densities.

"(g) **Temperature.** Increase of temperature has a deleterious effect upon the character of the deposit, increasing the grain size and decreasing the tensile strength.

"(h) **Addition Agents.** The use of addition agents of the colloidal type such as glue or gelatin, or of the crystalloidal type such as aluminum sulfate and sodium chloride, very often has a markedly beneficial action upon the character of the deposited metal and, in many cases, is absolutely essential for the production of a smooth fine-grained deposit.

"During electro-deposition polarization effects arise. Many workers have studied this phenomenon and have noticed its reaction on the quality of the deposit and the efficiency of the process, but it is only fairly recently that suggestions have been put forward that cathodic polarization and the grain size of the electrodeposit are inter-related."

* * * The authors therefore decided to carry out a series of investigations into the effect of addition agents upon the cathode polarization and the nature of the resulting deposit of the cell $Cu/CuSO_4$. H_2SO_4/Cu in order to try and determine whether any correlation existed between them."

"The following conclusions can be drawn from the experimental work, namely, that the use of an addition agent results in every case in

"(a) An increase in cathodic polarization,

"(b) Decrease in conductivity of electrolyte,

"(c) Reduction in grain size of the deposit (exception peptone where deposit was powdery and unsatisfactory)."

The above article will prove of interest to those using addition agents in connection with acid copper plating in either electrolytic copper-refining or in electrotyping and the generalizations appearing in the first paragraph are a very accurate analysis of the results of some twenty-four investigations published within the last thirty years.

INSOLUBLE SULFATES AND PASSIVITY

By LEON MCCULLOCH

The Transactions of the American Electrochemical Society Volume LVI, 1929

The author conducted experiments in which he demonstrated that the anhydrous sulfates of iron, nickel and chromium are difficultly soluble in water and points out that these sulfates may compose the films which cause passivity of these metals when used as anodes in sulfuric acid or in sulfate electrolytes.

The most common explanation of passivity is that due to oxide films, but this paper also calls attention to the possibility of films of slowly soluble anodic products causing passivity.

The discussions appearing in the transactions will prove of interest to those working with these metals.

SOME RECENT DEVELOPMENTS IN PROTECTIVE COATINGS FOR ALUMINIUM AND ITS ALLOYS

By H. SUTTON, M.Sc.

Electroplaters' and Depositors' Technical Society of England

This paper is a very complete survey of the various methods of producing protective coatings for aluminum and its alloys. The methods discussed are briefly as follows:

Anodic Oxidation of Aluminium and Its Alloys. The anodic process consists in making the article to be treated the anode in a bath of 3 per cent aqueous chromic acid solution, with the voltage being raised gradually from zero to 40 volts in 15 minutes, maintained at 40 volts for 35 minutes, raised to 50 volts in the course of 5 minutes and maintained at 50 volts for an additional 5 minutes. By this means a protective coating of oxide is produced on all parts of the surface accessible to the electrolyte.

The proper control of the voltage with time is essential for success and a generator having its maximum efficiency at about 40 volts and capable of working satisfactorily at as low as one volt, is required. Steel and stainless steel have been used as tanks. Other metals should not come in contact with the solution. Graphite, steel, or stainless steel (.1 to 1.5 per cent carbon, 12 to 14 per cent chromium) have been used as cathodes.

The sulfate content of the bath should be kept below .05 grams per litre and when the electrolyte is in use for a long time it becomes fouled with products from the anode consisting of iron, aluminium and impurities. Chlorides are detrimental and the chloride

content of ordinary city water is frequently so high as to necessitate the use of distilled water. With increase of bath temperature, the maximum safe voltage which can be employed in the treatment is reduced.

The above process can be applied to aluminium, duralumin and most aluminium alloys with the exception of those containing 5 per cent copper. The so-called strong alloys can be processed either in the heat-treated, aged, or softened condition.

The Jirotka Process. The protective film is obtained on the surface by immersion in an aqueous solution of chromates and the salts of heavy metals and operated at moderate temperatures.

The Stafford O'Brien Process. "Precise details are not available, but the process is stated to consist of anodic treatment at low voltage in sulfuric acid containing a chloride, and is a method of producing films on aluminium and aluminium alloys for protection against corrosion. It is claimed that the process is effective on aluminium and aluminium alloys, including the high copper-alloys."

Anodic Treatment of Steel. "None of the processes mentioned so far is suitable for the production of a protective film on steel. By the use of an appropriate electrolyte, however, it is possible to produce adherent black films of pleasing appearance on steel. A solution containing 30 grams of lead nitrate and 30 grams of ammonium nitrate, per litre is a suitable electrolyte for the purpose. Steel parts are treated at 3 to 4 volts and a current density of about 8 amps. per sq. ft."

Coating of duralumin and similar alloys with pure aluminium give a product known as Alclad, and offer exceptionally good protection. The makers claim that the cut edges of such material are entirely protected by the pure aluminium coating. The above is well-known to most people in America as are the methods of calorizing and electroplating on aluminium. Both of these are discused in some detail.

Photographs of Electroplates

By A. J. PHILLIPS

Metallurgist, Scovill Manufacturing Company, Waterbury, Conn.*

THE Chemistry and Test Department of the Scovill Manufacturing Company, Waterbury, Conn., has recently been equipped with a new metallurgical microscope. The apparatus was built by E. Leitz, Inc., and is one of the finest of its kind. With it photographs can be taken at magnifications from 10 to 8,500 times.

This microscope gives promise of revealing hitherto unrecognized details of metallurgical structure. It has already been used to great advantage in examining plated articles. There are three important attributes for a good plate: 1st, the plate must be reasonably thick; 2nd, it must adhere well to the base metal; 3rd, it must be sound and relatively free from pits. All three of these qualifications can be determined by microscopic examinations.

When a plated sample is received in the Laboratory for examination a strip is cut from it and mounted on edge by casting a low melting point white metal alloy around it. This edge section is then very carefully polished on different grades of emery cloth and on three special cloth covered wheels saturated with fine flour emery. The last polishing wheel used is covered with high grade black English broadcloth and the polishing agent is jeweler's rouge suspended in water. While this leaves the surface of the specimen very highly polished, it does not in any way resemble a buffed surface which is smeared or flowed smooth. The polished specimen is usually, although not necessarily, etched with a chemical reagent to contrast the structural constituents, and is then ready for microscopic examination.

Since a very heavy plate on brass is seldom over .0005" thick, it can be readily understood that the conventional magnification of 75 or 100 times is not used. A magnification of 1000 times is commonly used and for thin plates higher magnifications are imperative for accurate work. Chromium plates are quite commonly .00002" thick which at a magnification of 1000 times would appear to be only .02" thick. If a magnification of 5000 times is used the plate appears to be. .1" thick and can be measured with considerable accuracy.

Figure 1 shows magnified 1000 times, a cross-section through a triple plated brass article. Next to the brass there is a plate of copper .00022" thick, then a nickel plate .0004" thick and finally a chromium plate 0.00006" thick. In Figure 2, an unsatisfactory plate is shown, the nickel being only .00002" thick and the chromium too thin to detect (less than .000005").

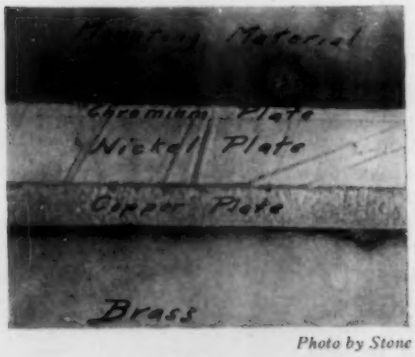


Photo by Stone

Fig. 1
Triple-Plated
Brass,
× 1000

Fig. 2
Unsatisfactory
Plate,
× 1000

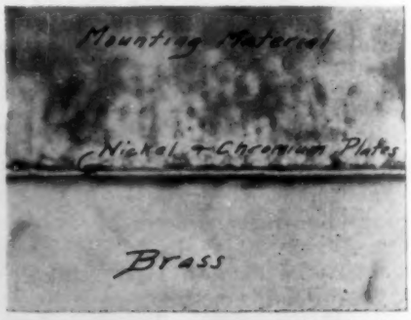


Photo by Stone

* From the Scovill Bulletin, March, 1930.

A Convention and Exhibition on Electrodeposition

A Report of the Annual Meeting of the Electroplaters' and Depositors' Technical Society of London, England

By S. WERNICK
Honorary Secretary

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE Electroplaters' and Depositors, Technical Sociey held its Annual Convention on January 31st at the Northampton Polytechnic Institute, St. John Street, Clerkenwell, one of the most interesting features of which was an exhibition, representative of modern scientific and practical advance in electrodeposition. This may be claimed to be the first exhibition of its kind devoted entirely to the interests of the many phases of electrodeposition ever held in this country. Its uniqueness indicates the big developments which have taken place in the technique of electrodepositing metals most of which have occurred within the post-war period.

The afternoon meeting was addressed by Dr. Rosenhain, of the National Physical Laboratory, Teddington, the subject of whose talk was "Research and Practice." The evening session was devoted to a discussion on "The Present Position of Chromium Plating," the attendance being in excess of 200 people. Dr. R. S. Hutton, Director of the British Non-Ferrous Metals Research Association and President of the Electroplaters' and Depositors' Technical Society, was in the chair. The discussion which ranged over a series of topics but was concerned mainly with the practical aspects of chromium plating was of outstanding interest and lasted over two hours.

THE EXHIBITION

The exhibition may be said to have been fully representative to every phase of electrodeposition art and science. These "phases" may be broadly classified as follows:-

Electroplating for Decoration and Protection.

The decorative effect was naturally largely represented by the newest metal with which the electroplater has recently become familiar, namely, chromium, and several of its applications in industry were to be seen—particularly the industries devoted to automobiles and household and sanitary fittings. The exhibits of Messrs. W. Canning & Company, Ltd., Crauer & Weil, and J. Nixon & Company, illustrated the excellent type of chromium deposits it is possible to obtain today. Messrs. Matchless Motor Cycle Company, showed the bright parts of their product beautifully finished in this metal while the meritorious exhibit of the Kings Cross & Attwood Plating Company indicated how far the chromium plater has gone in solving the problem of the poor throwing power of the chromium plating solution, one of their exhibits being a beautifully ornamented clock, every crevice of the intricate design of which had been entirely covered with chromium.

Electroplating for corrosion prevention was illustrated by exhibits of zinc and the more recently adopted cadmium plating upon iron and steel parts. The Royal Aircraft Establishment of Farnborough exhibited examples of zinc and cadmium plating upon aluminium. In this connection, the exhibit of Ulick R. Evans, the well-known expert on corrosion, was very interesting, this consisted of deposited and other coatings upon iron after they had been submitted to corrosion tests. The Royal Aircraft Establishment also exhibited samples of aluminium to which the anodic process had been applied, together with

Some of the Exhibits at the Electroplaters' and Depositors' Exhibition at Northampton Institute, London, January 31, 1930

specimens of the film of aluminium oxide which had been separated the thickness of which was as little as one eighty-thousandth of an inch. This, however, did not by any means represent the thinnest film to be seen! These were a special exhibit sent by Dr. Mueller from the Physikalisch Technisches Reichsanstallt, Charlottenburg, Berlin, and consisted of gold and nickel foil, the former 60 millimetre and the latter 80 millimetre in diameter, the thickness of each being 0.00002 millimetre or less than one millionth of an inch! These films although completely transparent are entirely free from pores, and one of the applications of the films is for use as windows for vacuum cathode ray tubes.

Electroplating, Etc.

Exhibitions of applications of electrodeposition to art were shown by several firms who are specialists in this work. The Standard Plating & Kupron Works showed some excellent examples of art metal work, in particular deposits on porcelain plaster and glass, while the British Metallising Company had a very effective exhibit of silver ware, in particular silver deposits made by their cold colloidal process upon vulcanite, glass and cellulose acetate, while chromium deposits on Bakelite, Ebonite and other insulators were also shown. The exhibit of the London School of Printing illustrating the production of electro and stereotypes was much admired, while that of the Gramophone Company, Ltd., of Hayes, illustrating the production of the "master" record aroused considerable interest, as did the solid objects, trays, tubes, etc., produced purely by electrodeposition exhibited by Sherard Cowper-Coles.

Some of these processes are new, but as illustrating the fact that the electroplater was by no means a fool at his craft, an exhibit of a Birmingham plater, Mr. Hodgetts, of several objects which had been deposited some 30 years ago, was illuminating. These consisted of a plated bone-handle and a glass bottle in silver and a couple of plaques in copper.

Thick Deposits.

In contrast to the thin deposits just mentioned, one of the most interesting exhibits illustrated one of the newest and most valuable applications of electrodeposition. This consists in the repair of worn parts of machinery by "building" this up with electrodeposited metal and then machining or trimming down to the size required. This method of repair was first tried during the necessitous days of the war, and has since been greatly developed. Messrs. Thomas Try, Ltd., showed some examples of built up engineering parts, in electrodeposited nickel as well as iron. Deposits as thick as ¼ inch were shown, having a finely crystalline structure and showing perfect adhesion to the base metal. Similar thick deposits were also shown by the Research Dept. of the Woolwich Arsenal, whose exhibit will be dealt with in detail below.

Precious Metals.

Messrs. Johnson Matthey & Company, Ltd., showed an exhibit of precious metal deposition, including deposits of platinum and palladium and platinum black. They also showed electrolytically refined gold and silver of high purity. Messrs. Boosey exhibited some fine silver plating upon large musical instruments of complicated design showing remarkable uniformity, and also chromium plated instruments indicative of high throwing power.

Other Developments.

Messrs. Eck & Brook showed a photograph of a motor generator which is claimed to be the largest to be installed in this country for chromium plating work, motor generators for the supply of current which have had to be enlarged continuously as the chromium plating plants have grown. This giant generator is capable of delivering 12,000 amps at 6 volts, while it can in an instant be changed over to 6,000 amps and 12 volts. They also exhibited a "Multithermograph" capable of making and recording a number of miscellaneous readings of the bath and electrical conditions obtaining. Messrs. Standard Telephones and Cables showed electrolytic iron which was produced in a high state of purity, and subsequently used to manufacture iron cores, etc., of given electro-magnetic properties by hydraulic pressure exerted on these powders after placing in a mould.

Exhibit of Woolwich Arsenal.

Probably the most comprehensive exhibit of all was that of the Research Department, Woolwich Arsenal. Various aspects of nickel deposition in which the Department is particularly interested were illustrated. A number of methods for rapid measurement of the pH of nickel solution, including the comparator, the Woulff pH testing set and celluloid strips impregnated with indicator solution giving a series of colors, were shown. Chromium plating which is file proof and examples in both ductile and brittle chromium deposits were on view. Apparatus to illustrate the thickness of actual nickel it is possible to obtain, the formation of pits, cracks and peeling with which the Department has been experimenting, and the effect of impurities in the solution upon the deposit was ingeniously arranged, and specimens showing the ductility and stress in nickel deposits produced under different conditions also shown. Probably the most interesting exhibits to the technical visitor were those illustrating the X-ray spectra of deposited nickel, showing in striking fashion the difference between hard and soft nickel deposits. The soft deposit is shown to be built of nickel crystals nearly all of which have their cube faces nearly parallel to the plane of the deposit, but have a random orientation about the direction of the current. The hard deposit, on the other hand, is built up mainly of a random arrangement of nickel crystals, but there is an appreciable number of crystals with their dodecahedral planes parallel to the plane of the deposit, thus giving a weak symmetrical pattern in the perpendicular spectrum.

Senate Completes Tariff Schedule

THE U. S. Senate completed its work on the tariff schedules on March 22nd, and on March 24th took up the bill as a whole with the House of Representatives.

The details of the final bill are still in doubt. When it is passed by both Houses we will publish a list of all items of interest to the metal and plating trades.

In the meantime, special points of interest are as follows:

1. **Flaked graphite:** present tariff, 1½c per pound; House bill, 1¼c per pound; Senate bill, 2c per pound.

2. **Aluminum, crude, scrap and alloys:** present tariff, 5c per pound; House bill, 5c per pound; Senate bill, 2c per pound.

3. **Aluminum plates, sheets, bars, strips, rods, coils, blanks, circles, discs, rectangulars and squares:** present tariff, 9c per pound; House bill, 9c per pound; Senate bill, 3½c per pound.

4. **Aluminum foil:** present tariff, 35 per cent; House bill, 40 per cent; Senate bill, 35 per cent.

The general tendency of the tariff schedules as a whole is upward.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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Vol. 28 New York, April, 1930 No. 4

Contents

THE METAL INDUSTRY is regularly indexed in The Industrial Arts Index

Edition this Month, 6,500 Copies. Buyers Guide, Advertising Page 93

Editorial

Business Progress

Business continues to improve slowly. It seems certain now that the bottom was reached several months ago and that we are in the process of building up.

According to the National Business Survey Conference, headed by Julius H. Barnes, in Washington, D. C., the general tendency is upward. The outlook in the investment field is favorable, short term credit in the open market and in the banks is easier, savings bank deposits have increased, new life insurance is ahead of last year, building and loan associations show a marked increase in receipts for the closing months of 1929, installment sales are approximately equal to last year with no marked increase in delinquencies, new construction for utilities will be considerably ahead of last year and other construction should equal last year. Building materials and supplies are dull on the whole, due to the lag in residential building. Steam railroads are ordering more than any previous year, electric railways contemplate a $45,000,000 increase, shipbuilding yards are employing 28 per cent more men than a year ago and telephone construction expenditures in January were 25 per cent ahead of January 1929. The radio industry is liquidating stocks, this process being now about 85 per cent completed.

The iron and steel industry is operating at about 75 per cent capacity. Automobiles are going at the rate of 4,600,000 cars per year. Machinery sales are normal, with inquiries in good volume. Chemicals are slow. Electrical manufactures show a payroll index for February, 6 per cent higher than last year. Hardware improved in March over February. Textiles are somewhat below last year; printing, slightly ahead. Retail and wholesale trades are buying cautiously but the volume seems to approach last year's. Copper sales are spotty, but the price situation is unchanged.

We can look forward to a steady, if not a large increase in business.

Copper Achieves Popular Fame

The Harvard Advertising Award for the 1929 advertisement distinguished for its effective use of typography was won by an advertisement of the Revere Brass and Copper Company, Inc., an organization which includes in its members the Taunton-New Bedford Copper Company, originally founded by Paul Revere of Revolutionary fame. Copper is essentially a technical material, until recent years known very little to the lay public except superficially. For that reason it is gratifying that public recognition has come to it in a genuine, dignified fashion.

It is noteworthy also that Paul Revere, in addition to being a sterling patriot, was a sound and trustworthy manufacturer of copper and copper products; also a good business man who knew how to write a straightforward simple sales letter, like the following:

BOSTON, Dec. 31, 1798

Benjamin Stoddard, Esq.
Naval Secretary at Philadelphia.

Sir:

I understand you have advised the Committee for building the Frigate in Boston not to send abroad for anything they can get manufactured in this country; those Sentiments have induced me to trouble you with this letter. I can manufacture old or new Copper into Bolts, Spikes, Staples, Nails, etc., or anything that is wanted in Ship-building; that is, cast of copper into pigs, draw the pigs into Barrs under the Forge hammer and then manufacture the Barrs into Bolts, Spikes, Nails, etc., etc. I supplied the Constitution with Dovetails, Staples, Nails, Etc.

My greatest difficulty is to get Copper. Could I get a sufficient supply of Copper, I would undertake to roll Sheet Copper for sheathing ships, etc.

I have been induced to trouble you knowing that you are at the head of the department where you have the best means of knowing the resources of the country and your willingness to communicate anything that may be for the public good.

You will permit me to offer my services to you in Manufacturing Brass Cannon, Bells, Copper Bolts, Spikes, etc., etc.

I am, sir, with every sentiment of esteem
Your hum. Servt.
PAUL REVERE.

As the general public becomes more widely educated it will know more about the technical fields of science and industry. It is a credit to metals that they will be in the forefront to receive their due.

Research and Practice

An interesting contrast was revealed by Dr. Walter Rosenhain in his address at the meeting of the Electroplaters' and Depositors' Society in London, England, a report of which is published on page 177 of this issue. In an article published in the Encyclopedia Britannica on electroplating twenty-five years ago, the writer made casual reference to the "power-driven machine" for the supply of electric current and in addition stated that he was not sanguine about the prospects of electrolytic copper refining. It is to be hoped that the said writer is alive today to realize the danger of long range predictions.

Dr. Rosenhain pointed out that caution and good judgment are required in conducting research. There is a complexity of conditions difficult to control in the plant as compared with the simple conditions existing in the laboratory. Cooperative effort between science and industry is necessary to make available better methods and better men, and such a pooling of knowledge would mean everything to gain and nothing to lose.

In electroplating research, difficulties have been overcome by attacking them under simple and carefully controlled conditions, temperature, current density, voltage, addition agents, etc. He pointed out the results of the work under the Electrodeposition Committee of the Department of Scientific and Industrial Research, in England, such as the reduction in stress of nickel deposits by the use of superimposed alternating current, and the deposition of a layer of lead between the base metal and the nickel; also the prevention of corrosion by means of cadmium and zinc,

and the electrodeposition of chromium. He pointed out that research is not a short cut to wealth. It is really a sustained attack on the unknown, using scientific principles; in other words, the application of common sense.

Everything that Dr. Rosenhain said is applicable to the research program undertaken by the American Electroplaters' Society. It is probably the most important single project of its kind, and it deserves the continued support of the electroplating industry.

Corrosion Resisting Metals

For the last decade at least, engineers and designers of buildings and equipment have been awake to the need for materials which will withstand various types of corrosion. It took only a short time for metallurgists to discover that there was no one metal or alloy which could be used under all conditions. Different chemicals call for different resistors. As a result the field has been open to the competition of all mixtures, ferrous and non-ferrous, with many questions still unanswered.

For a while, steel lagged behind in this race, although the stainless steels containing appreciable percentages of chromium were looked upon with favor. But the non-ferrous alloys, aluminum bronzes, manganese bronzes, Monel metal and the so-called acid-resisting bronzes, held the lead.

During the last year or two, the chrome nickel steel alloys have attracted much attention. The type known as KA2, containing about 18 per cent chromium and 8 per cent nickel, is recommended for severely oxidizing conditions, such as hot strong nitric acid and glacial acetic acid. The steel containing a higher percentage of nickel than chromium and relatively high contents of copper and silicon is recommended for ferric sulphate resistance. An interesting paper by Mr. Schenck, president of the Duriron Company of Dayton, Ohio, read before the Society of Mechanical Engineers, in Buffalo, February 25th, describes the different types of chrome nickel steels with their uses.

Mr. Schenck made the very wise suggestion that more thorough testing of corrosion resisting materials should be made under actual service conditions before specifying them. If expensive installations are made on routine laboratory tests with only a scanty background of experience, expensive failures are very likely to occur.

War Wastes Metals

The Naval Conference in London has now been going on for months in an attempt to reduce or at least to limit naval armament, thus preventing competitive building by the different nations with the consequent danger of incitement to war. Incidentally the saving of expense, which has grown enormous in naval construction, must be no small item in the minds of the nations' rulers.

Metals form a far from unimportant factor in naval equipment. Battleships, cruisers, destroyers, torpedo boats and ammunition use large tonnages of copper, nickel, lead, zinc, brass and bronze. It is safe to say, however, that no industry wishes success to this conference more than the metal trades. Building for destructive purposes is so clearly wasteful, it represents human effort so hopelessly lost that there is no defense for it. The late Charles F. Brooker, head of the American Brass Company, stated this clearly in an interview published in our issue of January, 1922.

Metals have adjusted themselves to peace and do not need war for an outlet for their products. In the long run industries flourish best under conditions of tranquility and opportunities for steady progress.

The Electroplaters' Convention

The coming Convention of the American Electroplaters' Society will be held in Washington, D. C., June 30th-July 3rd inclusive. We hope that this note will serve as an early reminder to the members, and non-members who are interested in electroplating, to begin to make their plans now to attend this Convention. One more reminder is in order which we will repeat from time to time. Everyone who travels to Washington must be certain to turn in his certificate to the railroad at the Convention in order that he may get the benefit of the reduced fare on the return trip. Care in attending to this detail will save the Society in the aggregate thousands of dollars.

A. P. Munning Retires

A. P. Munning, chairman of the board of the Hanson Van Winkle-Munning Company, Matawan, N. J., is retiring from active participation in that company and leaving the field of electroplating and metal finishing (see announcement on page 174 of this issue). Mr. Munning leaves behind him the largest organization in its field, a business strong and flourishing and a leading influence in every sense of the word.

Aside from his extraordinary success in building up a manufacturing organization of such a high order, Mr. Munning will be remembered for his unremitting efforts to improve the electroplating industry as a whole. He has always been an outstanding personality, maintaining his principles of fair dealings with customers and competitors alike. He has encouraged research and spread the gospel of intelligent progress.

Mr. Munning leaves the industry with its best wishes for his future happiness, in which THE METAL INDUSTRY heartily joins.

William Howard Taft

William Howard Taft, ex-president of the United States and Chief Justice of the Supreme Court, passed away early in March. He was the only man in our history to hold both of these positions, in that way being honored like no other American.

He will be remembered as a wise, upright and sincere public servant. In his contacts with industry, he distinguished himself for the fairness and breadth of view of his judgments. One of his decisions had to do with the aluminum patents about which there was so much litigation in the early days of that industry.

Mr. Taft was fortunate in spending the last years of his life in the type of work which he loved best, the judicial. His career is a beacon light for young and old.

Correspondence and Discussion

Statuary Bronze Finish

To the Editor of THE METAL INDUSTRY:

In the following dip, copper or bronze may be oxidized in such a manner that it can quickly be scratch-brushed to show a uniform shade of statuary bronze:

Water	1 gallon
Sulphate of ammonia	1 oz.
Barium sulphide	1 oz.

Of course, articles should be clean, as for plating, before dipping. The dip should be used cold. Various depths of color can be produced by varying the strength of the solution.

When articles are removed from this dip, care should be taken to rinse well in cold and hot waters and, when dry, to coat with a good grade of lacquer. ANDREW V. RE.

Chicago, Ill., March, 1930.

Praise from Canada

To the Editor of THE METAL INDUSTRY:

Your letter containing results of analyses of my brass solutions is before me, for which I thank you.

In a former letter you asked why I was not a subscriber to THE METAL INDUSTRY. My answer is that while I am not a subscriber, I have been a reader for many years, and I consider it just about the best publication of its kind in either the United States or Canada.

During the past eight years the firm which employs me has presented me with the monthly copy and also with the BRASS WORLD.

Again thanking you for your good work, I remain,

DAVID AYERS.

Prescott, Ontario,
March, 1930.

New Books

Principles of Electroplating and Electroforming. By William Blum and George B. Hogaboom. Published by McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York. Size, 6 x 9; 424 pages; price, $4.50.

Reviewed by DR. C. L. MANTELL

The second edition of this well-known volume is a welcome addition to our electroplating literature. In the first edition of this book an effort was made to serve both platers and chemists by bringing to the former some knowledge of chemistry and to the latter some knowledge of plating. It was, of course, realized that to cover these fields fully in so limited a space was impossible, and hence there were many intentional omissions of facts or principles that might have found place in a more comprehensive treatise.

In the revision of the book there has been a successful effort made to have every statement as accurate as present-day knowledge permits, with explanations in a clear and simple manner.

As in the first edition, some 20 per cent of the text (Chapters 1 to 6) is devoted to the principles of chemistry, chemical analyses, electricity, and electrochemistry. These are explained in a clear and lucid manner without any sacrifice of scientific accuracy. Chapter 7 deals with the factors governing the character of the deposits, such as current density, concentration, agitation, temperature, conductivity, metal ion and hydrogen ion concentrations, addition agents, structure of base metal, metal distribution and throwing power. Chapter 8 concerns itself with the selection of electrodeposits for specific purposes and the testing of these deposits. Chapter 9 deals with the preparation for plating, such as pickling and cleaning; and chapter 10 deals with the same subject for electroforming. Chapter 11 discusses electrical equipment. It is a little unfortunate that the authors did not find enough space available to treat this subject more fully. Chapter 12 treats of tanks and their equipment. Little is said, however, on the important subject of barrel plating, barrel construction and usage. The remaining 50 per cent of the book concerns itself with the deposition of the individual metals, methods of operation of the baths, and analyses of the baths. The metals dealt with are copper, nickel, cobalt and iron, chromium, zinc and cadmium, lead and tin, silver, gold and platinum, and alloy platings. The space given to some metals is not proportionate to their commercial importance. For example, zinc deposition is treated in 17 pages, while the very important topic of cadmium plating receives only 2 pages. The section on tin deposition makes no mention of the advances of this art, particularly some of the important work of the Roessler and Hasslacher Company. The chapter on the deposition of alloys appears to be too brief, in that it is felt that some mention should be made of the other important alloy deposits, such as the mercury alloy type coatings, Permaloy, and some of the heat treated alloy-forming coatings.

The last chapter in the book is on experiments in electrodeposition. In view of the fact that the subject matter has been covered in the body of the text, the advisability of devoting these pages to the subject is questionable.

Taken by and large, the volume is by far the best available one on the subject of electroplating and electroforming. It should be in the library of every up to date plater who realizes that the "art" of plating has rapidly become a science and the mysteries are being wiped out. The volume is an extension of the widely appreciated "missionary work" of Dr. William Blum and Mr. George B. Hogaboom who have devoted so much of their spare time and energy to the advancement of knowledge and dissemination of information among platers. As an educational and reference treatise, the book is an excellent one.

Electroplating with Chromium, Copper and Nickel. By Freeman and Hoppe. Published by Prentice-Hall, Inc. Size 6 x 9, 212 pages. Price, $5.00, payable in advance.

The rapid rise of chromium plating which has carried up with it electroplating in general, has been the reason for a vast amount of literature in the technical and scientific press on chromium plating, the chemistry of plating solutions, chemical and physical control of solutions, etc. This book is the first bound volume of information, devoting itself to a considerable extent, to the subject of chromium. The authors have made a collection of data that has been published from time to time and have rewritten and rearranged it, making it suitable for book form.

To the person who is not familiar with the deposition of chromium and the large amount of published data, this book will be extremely valuable. To the man who has kept in close touch with the progress of chromium plating, the book will also serve as a reference work. The data may not be new but it is fundamentally correct and conveniently placed. Subjects covered by the book are as follows:

Fundamental Electrical Considerations; Chemical Fundamentals; Applications of Chemistry; Plating Department; General Remarks on Polishing and Polishing Compounds; Cleaning Surfaces for Electroplating; Specifications for Plating; Deposition of Copper; Nickel; Chromium; Testing Deposits and Solutions.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Black Nickel Finish

Q.—Would you be good enough to give us a good formula to black nickel over nickel plate. We are desirous of obtaining a black finish over plated files. Could they be oxidized without giving them a copper flash? The copper flash was on the point or the handles after we buffed off the black.

A.—Nickel plated articles cannot be oxidized directly on the nickel. It is necessary to flash them with copper and oxidize on top of that. For a black nickel finish make a solution as follows:

Water	1 gallon
Double nickel salts	8 oz.
Zinc sulphate	2 oz.
Sulphocyanate of soda	2 oz.
Benzoic acid	2 oz.
Boric acid	2 oz.

Use nickel anodes; one volt pressure; three amperes per square foot of surface. You should get a coal black deposit in from 45 to 60 minutes run.

Neutralize acid in solution with nickel carbonate to pH 7.

The addition of copper carbonate gives a smutty soft deposit which is not desirable for your work.

The zinc will be used up the fastest as the nickel deposited is replaced from the anodes. The solution when in use should be stirred up thoroughly daily. —W. F., Problem 3,952.

Cadmium on Copper Cable

Q.—We would like to deposit cadmium on stranded copper wire cables and have heard that it can be done from a hot solution in the same way that a tin powder and sodium carbonate solution will deposit tin. However, we do not know the details of the process.

We would be very pleased to have you give us the necessary information.

A.—To successfully cadmium plate your class of work will require special equipment. We suggest that you get in touch with one of the platers' supply houses that deal in plating equipment. (See THE METAL INDUSTRY advertising pages.)

The following solution can be used with good results for still plating; but may require a higher concentration of the different constituents for mechanical plating:

Cadmium oxide	3 oz.
Sodium cyanide	9 oz.
Caustic soda	2 oz.
Water	1 gallon

Temperature 80° F.; cathode current density, 8 to 10 amperes per square foot for still plating. —O. J. S., Problem 3,953.

Defective Nickel Solution

Q.—I am sending you a sample of nickel solution for analysis and advice, as the bath works imperfectly.

A.—Analysis of nickel solution:

Metallic nickel	3.51 oz.
Chloride	0.92 oz.
pH	6.8

We would suggest that you add one ounce of sodium chloride and 2 oz. boric acid to each gallon of solution; and to every 100 gallons of solution add 10 fluid ounces of C. P. sulphuric acid.

O. J. S., Problem 3,954.

Hewitt Metal

Q.—Can you tell me what "Hewitt Day Metal" is? What are its properties and to what extent is it used in the foundry?

A.—The information we have on the composition of Hewitt metal is as follows: Half copper and half lead; or 55 per cent lead and 45 per cent copper; or 45 per cent lead and 55 per cent copper. It is used for packing rings for locomotive engines. We believe this is the alloy to which you refer. If not, we have no other record. —W. J. R., Problem 3,955.

Numbers on Radio Tube Shields

Q.—We are making a shield for a radio with the tube numbers stamped on the outside of shields. We are finishing these in cadmium and putting a butler silver bronze powder over the cadmium plate.

Now we want to put something on these numbers which will distinguish different numbers in different colors. At the present time we are using a wax crayon and filling the figures and wiping the surplus off, but are getting a very unsatisfactory job. I was wondering, if possible, if you would give us the information for putting on different colors; whether it is lacquer; and what it might be that is used on clock dials; or what we could use that would give us good production and be durable as well.

A.—We assume that the numbers on the shields are to be depressed figures instead of raised. With your method of plating and finishing this leaves the filling of the numbers as the final operation.

If the filling material comes in contact with the coating of silver bronze powder, it is difficult to wipe off without leaving a trace of color, due to the slight roughness of the surface.

A very satisfactory material to use for filling is printer's ink. This can be had in any color desired and in any quantity. If too heavy, thin with turpentine to proper consistency. The filling may be done from a compressible tube fitted with a nozzle, or with a brush, avoiding the need of wiping any excess from the surface. The inks flow freely, set well, and retain their colors. For this purpose they are superior to lacquers. —W. F., Problem 3,556.

Pewter Finish

Q.—We are interested in finishing brass to resemble pewter. We do not want to use a spray finish, so presume it must be done by plating.

If you can let us know the method to adopt we will greatly appreciate hearing from you.

A.—The pewter now seen is, in general, composed of 95% tin and 5% lead. The lead takes away the pure tin color. To imitate the pewter color by electroplating it would be necessary to deposit a tin-lead alloy. The only successful solution for depositing that alloy is from the fluoborate tin-lead solution. To make this alloy solution, a fluoborate lead solution is made and tin is "run in" from pure tin anodes until the required composition is obtained. Due

to the effect of hydrolysis on a fluoborate tin solution, it would be difficult to reverse the above operation.

This makes it an expensive operation to produce a tin-lead solution of the composition of pewter. We know of no other successful tin-lead solution.

It is suggested that the brass articles be given a deposit of tin which should be scratchbrushed with pumice and water. The article can then be given a "flash" in a lead solution and wet scratchbrushed again, this time not using pumice. In this way you may darken the tin deposit so that it will match pewter.

Fluoborate Lead Solution

Water	1 gallon
Basic lead carbonate	20 oz.
Hydrofluoric acid (50%)	32 oz.
Boric acid	14 oz.
Glue	0.025 oz.

Operate at 70° F.; 10 amperes per square foot; 1 volt.

Tin Solution

Water	1 gallon
Sodium stannate	24 oz.
Stannous chloride	¼ oz.
Rosin	1/32 oz.

Operate at 160° F.; 10 amperes per square foot; 3 volts.

Alkaline Tin Solution
(For "flash deposit")

Lead carbonate	6 oz.
Caustic soda	8 oz.
Water	1 gallon

Operate at 160° F.; 5 amperes per square foot; 3 volts.

—E. E., Problem 3,957.

Pinholes in Castings

Q.—We are having a little trouble on some of our bronze castings, such as traps and some other thin castings, which are showing small pinholes on the top. The molds are vented well and the sand seems all right. Will you give me a little information as to what causes this? The holes are in the castings after they are turned up.

A.—If the holes are clean, it is evidence that your trouble is due to gas held in the metal after solidification; that, is, the gas has been held in solution. It may be that by the addition of two ounces of 15 per cent phosphor copper you may correct this condition.

You say you vent the mold well and that the sand seems all right; therefore, your trouble must be either in the method of melting or the grade of metal you are using.

If you are using crucibles for melting, we suggest the use of charcoal to the contents of the crucible. The charcoal protects the metal and the carbon monoxide produced by the burned charcoal protects the metal from oxidation.

We also suggest quick melting. Do not let the metal soak in the furnace. If your trouble is in the metal you are using, the phosphor copper we suggest above will help. We suggest that you add two ounces of 30 per cent manganese copper and also a spoonful of salt to each hundred pounds of metal.

—W. J. R., Problem 3,958.

Porous Castings

Q.—We are experiencing considerable difficulty with some fairly heavy composition castings to be used for windshield frames. These pieces show, after polishing, a very porous and sometimes spongy texture. It also appears impossible to polish through to a solid base. We are using the following formula: copper 84¾ per cent, tin 10 per cent, lead 2 per cent, zinc 3 per cent, nickel ¼ per cent.

We have tried welding particularly bad spots but this only seems to make the condition worse. Inasmuch as we wish to chromium plate, using nickel, or copper and nickel, first, it is apparently necessary to correct the castings first.

If you could give us any assistance in this difficulty it would be a considerable favor to us.

A.—We are of the opinion that your trouble is caused by the metal and suggest:

First, use new metal. Melt the copper quickly and add the nickel, then the tin a little at a time. Stir well and cover the metal. Before pouring, add a spoonful of salt to the metal and deoxidize the metal with 3 ounces of 15 per cent phosphor copper just before pouring.

There is no question that, from what you say in your letter, your trouble is caused by oxidized metal causing gas which is given off in casting. We feel that if you will look after your melting practice and skin-dry your mold you will overcome your ficulty. —W. J. R., Problem 3,959.

Retinning Milk Cans

Q.—What process would you recommend for cleaning rusty milk cans which are to be tin plated? And also, what formula would be best for tin plating?

A.—The first step is to wash to remove dirt, grease, etc. This can be done by swabbing with an alkali solution.

Next, fill the cans with an oxalic acid pickle made up of one pound oxalic acid to each gallon of water. This will remove ordinary rust without seriously damaging the tin coating. If rust is too heavy, use instead a muriatic pickle made up of one quart muriatic acid to four quarts of water. This solution will remove the tin coating along with the rust.

Next, rinse thoroughly in cold water and brush well to remove the scum and hang in a tin solution made up as follows:

Sodium stannate	24 oz.
Sodium acetate	2 oz.
Caustic soda	1 oz.
Glue or casein	1/10 oz.
Water	1 gal.

Block tin or cast tin anodes; volts, 3 to 4; amperes, 10 to 20 per square foot; temperature, 125° F.

To plate the inside of the cans at the same time as the outside, hang an anode inside the can. After getting a sufficiently heavy plate, rinse and dry the cans and finish by scratch brushing, using a flexible shaft to brush the inside of the cans.

—W. F., Problem 3,960.

Solutions Analyzed

Q.—We are shipping by parcel post samples of solutions to be analyzed. No. 1 is a copper solution, No. 2, nickel solution, No. 3 nickel solution, No. 4 chrome solution.

Our trouble seems to be that the chrome is lifting the nickel. We have been having trouble with the coils in our chrome and it has weakened it so much that we are of the opinion that this is our trouble.

A.—Analyses of nickel solutions:

No. 2	Metallic nickel	3.14 oz.
	Chlorides	.85 oz.
	pH	5.8
No. 3	Metallic nickel	2.04 oz.
	Chlorides	2.34 oz.
	pH	5.6

We would suggest that you add to No. 1 tank 1½ oz. sodium chloride for each gallon of solution; also, 6 oz. of 26° ammonium hydroxide for each 100 gallons of solution. To No. 2 tank, add 4 oz. single nickel salts for each gallon of solution and 8 oz. of 26° ammonium hydroxide for each 100 gallons of solution. If possible, operate nickel solutions at 100° F., to produce a soft deposit.

Analysis of cyanide copper:

No. 1	Metallic copper	3.17 oz.
	Free cyanide	.54 oz.

This solution should be in good operating condition if used at proper temperature and current density. Use solution at 110° F.; cathode current density, 8 to 10 amperes per square foot.

Analysis of chromium solution:

No. 4	Chromic acid	22.20 oz.
	Tri-valent chromium	0.41 oz.
	Sulphates	0.40 oz.

The chromic acid is entirely too low; add 26 oz. chromic acid to each gallon of solution and operate at a temperature of 95° to 100° F., with a cathode current density of 50 to 75 amperes per square foot. —O. J. S., Problem 3,961.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,733,576. October 29, 1929. **Casting Machine.** George W. Bungay, Plainfield, N. J., assignor, by mesne assignments, to The United States Aluminum Company, Pennsylvania.

A casting machine comprising a die member, a piston to which said member is connected, a main cylinder slidably supporting said piston, fluid pressure means to actuate said piston in said cylinder, an auxiliary cylinder connected to a source of fluid supply and to said main cylinder, and a piston in said auxiliary cylinder having means to intensify the pressure of said fluid and to transmit the intensified pressure to the main cylinder.

1,734,706. November 5, 1929. **Cleaning Metal Surface.** Howard Adler, Chicago Heights, Ill., assignor to Diversey Manufacturing Company, a Corporation of Illinois.

The method of cleaning tinned metal surfaces and inhibiting corrosion of the tin thereof which comprises subjecting such surfaces to the action of a solution of trisodium phosphate in the presence of sodium dichromate.

1,734,909. November 5, 1929. **Electroplating Tank.** Charles E. Jones, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

In combination, a metal tank adapted to contain an electrolyte, an anode structure adapted to cooperate with said electrolyte, said anode structure including a plurality of metallic particles and a wire mesh retaining means, said wire mesh being connected to opposite sides of said tank and in electrical contact therewith, and means whereby current may be supplied to the walls of said tank.

1,735,000. November 12, 1929. **Copper Coating.** Joseph G. Dely, New York, N. Y., assignor to Chemical Research and Designing Corporation, New York, N. Y.

The process of coating a metallic object with copper which comprises applying a coat to the object, said coat containing a halide of sodium and an inorganic vehicle of the silicate type for said halide and copper particles, and subjecting the thus prepared object to a high temperature baking operation, whereby the copper particles are welded to each other and to the surface of said object in the form of relative large areas of substantially imperforate copper.

1,735,286. November 12, 1929. **Process of Coating Metallic Aluminum or Aluminum Alloys With Aluminum Oxide Skin.** Tsunetaro Kujirai, Nakano-Machi, Toyotama-Gori, and Sakae Ueki, Oji-Machi, Kitatoshima-Gori, Tokyo Prefecture, Japan, assignors to Zaidan Hojin Rikagaku Kenkyujo, Hongo-Ku, Tokyo, Japan.

In the process of electrolytically forming an insulating and anti-corrosive oxide coating on aluminum material, acting as an electrode, the step which comprises electrolyzing a solution of an oxalic acid compound in contact with said material.

1,735,509. November 12, 1929. **Process for Forming an Electrically Insulating and Anti-corrosive Oxide Coating on Aluminum Material.** Shoji Setoh, Tokyo, and Sakae Ueki, deceased, Oaza, Japan, by Uno Ueki, Oaza, Japan, administratrix, assignors to Zaidan Hojin Rikagaku Kenkyujo, Tokyo, Japan.

The process of forming an electrically insulating and anti-corrosive oxide coating on aluminum material which comprises simultaneously electrolyzing a solution containing an oxalic acid compound with alternating and direct current employing aluminum material as the positive electrode and electric conducting material as the negative electrode for the direct current.

1,735,842. November 19, 1929. **Process for Rustproofing Articles of Iron and Steel.** William H. Allen, Detroit, Mich., assignor, by mesne assignments, to Parker Rust Proof Company, Detroit, Mich.

The process of rust proofing iron or steel articles, which comprises dipping them into a solution containing chromium and phosphoric acid radical, and subsequently heating to a temperature sufficient to convert the chromium phosphate into chromium pyro-phosphate.

1,735,878. November 19, 1929. **Device for Measuring the Current Densities of Galvanic Baths.** Wilhelm Anton Franz Pfanhauser, Leipzig, Germany.

A device for measuring the current densities in galvanic baths comprising two electrodes, insulating means whereby said electrodes are effectively insulated from each other, an ammeter, electrical connection between said electrodes through said ammeter, and means for preventing electrolytic connection between said electrodes.

1,735,909. November 19, 1929. **Method of and Apparatus for Making Articles of Galvanoplastic Metal.** Gunnar Rosenqvist, Pittsburgh, Pa.

Apparatus for producing articles by electrolytic deposition comprising, a mold provided with depressions of the shape of the articles to be formed, a liner of flexible material disposed on the inner face of the mold having cut-out portions corresponding to said depressions but of lesser dimensions than the latter, said mould being recessed adjacent the edge of said depressions whereby the liner is firmly held against the face of the mold when subjected to the pressure of an electrolytic solution.

1,736,188. November 19, 1929. **Apparatus for Pouring Molten Metal.** John R. Daesen, Peru, and Leland E. Wemple, Chicago, Ill., assignors to Illinois Zinc Company, Chicago, Ill.

In an apparatus for pouring molten metals, the combination of a receiver for the molten metal suitable for immersion in a molting pot and having two chambers in communication with each other, an aperture in said receiver through which the molten metal is admitted to said chambers when the receiver is positioned within a melting pot, a closure for said aperture at the end of a rod extending through the molten metal to a point outside said receiver, mechanism for positively actuating said rod and therefor said closure, and a source of pressure communicating with one of said chambers and operative to force the molten metal in said chamber into the other chamber, and thence into a mold.

1,737,574. December 3, 1929. **Buffing Wheel Cloth and Process of Making the Same.** Bradford H. Divine, Utica, N. Y.

The process of manufacturing buffing wheel cotton cloth which consists in supplying the warp with sizing material before weaving, weaving unsized filling threads and said sized warp into cloth, with the weaving tension on the warp low enough relative to the tension on the filling threads to make the warp threads bend appreciably at the crossing points of said warp.

1,738,515. December 10, 1929. **Electroplating Apparatus.** William E. Belke, Chicago, Ill.

In electro-plating apparatus, a rigid rack for supporting the articles to be plated, said rack comprising a single spine having both cathode and anode terminals projecting therefrom in fixed relation, the cathode terminals adapted to support the articles to be plated, and the anode terminals being disposed in position to facilitate and insure the desired plating of said articles.

1,738,727. December 10, 1929. **Apparatus for Use in the Electrolytic Deposition of Metal on Metal Tubes.** Frederic John Pike, Beckenham, and Cyril John Lyth, Woolwich, London, England, assignors to J. Stone & Company Limited, Deptford, England, a Company of Great Britain.

Apparatus for electroplating the bores of metal tubes comprising an electrolyte container, an elongated frame having spaced rings formed with peripheral tube-seating slots, closure devices operative for retaining tubes in said seating slots, end anode plates formed with peripheral slots.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

A New Copper-Base Alloy

P. M. G. Metal—A New Discovery in England

By OUR BRITISH CORRESPONDENT

P. M. G. Metal is an outstanding discovery recently developed at Vickers-Armstrongs, Ltd., Naval Construction Works, Barrow-in-Furness, England. It is a high-grade copper alloy possessing unusual qualities. It has a very short freezing range which approximates from 950 deg. C. to 900 deg. C., and consequently is an excellent casting alloy. It can be readily forged, and in the wrought condition the metal possesses greatly increased strength while retaining ample ductility. It is cheaper to manufacture than gun-metal, and, by its use in castings, porosity and unsoundness troubles are almost entirely eliminated. Nevertheless it is definitely superior to gun-metal in strength and other mechanical properties at normal and elevated temperatures, and has a large range of application where gun-metal, manganese bronze or other special brasses and bronzes are now in use.

One type of P. M. G. Metal consists of 88 per cent copper, 2 per cent zinc and 10 per cent of the P. M. G. Hardener, and which replaces the 10 per cent of tin in gun-metal. Owing to the excellent casting qualities, fewer foundry wasters, and the very high mechanical properties, etc., great savings are effected.

The foundry practice in the production of P. M. G. metal is similar to that of gun-metal and other bronzes. The final casting is similar in color to brass, has a uniform grain size and is uniform in composition, and density in varying dimensioned sections. In such castings the characteristic defects associated with ordinary brasses and bronzes are almost entirely eliminated. The metal may be readily forged and in this condition shows exceptionally improved mechanical properties over those in the cast condition. The metal can be extruded into bars of varying diameters without lamination or defect. It is also excellent as a bearing metal and is superior in service to the well-known phosphor bronzes.

The Driver-Harrison Company, of Harrison, N. J., has acquired the American rights to P. M. G. metal. On February 28 an exhibition was held at their foundry in which sample castings were poured before a good sized audience of visitors. At this gathering the following facts were given out by Dr. M. A. Hunter, consulting engineer:

"P. M. G. was originally intended as a substitute for Admiralty gun-metal, the standard composition of which is 88 copper, 10 tin, 2 zinc. The metal is a copper alloy in which the 10 per cent of tin is replaced by 10 per cent of a special hardener. In making the alloy, the addition of the hardener need not be confined, however, to 10 per cent. If a greater hardness is required, larger additions of the hardener may be made. In our experiments we have varied the percentage of hardener from 1 per cent to 18 per cent, and in zinc from zero to 40 per cent and have information on the properties of the resultant alloys. The alloy which you will see in the foundry operations today is, however, the 88/10/2 alloy, the equivalent in composition of gun-metal.

"The alloy as cast contains as its major constituent 2 per cent of iron and 3.4 per cent of silicon with 2 per cent of zinc. The hardening is presumably due to the presence of iron silicide. This compound dissolves at high temperatures in the molten copper. On cooling, the iron silicide precipitates from the solid solution in such a manner as to increase the hardness of its solidified alloy. The properties of the metal, as in similar cases of precipitation hardening can be modified by a heat treatment consisting in quenching with or without reheating. To those who are particularly interested in the metallurgical aspect of this phase, the information is available.

Melting Practice

"The melting practice offers no difficulties. The metal is quiet under ordinary melting conditions and remarkably free from draws. It can be remelted with but little loss. It can be cast into sand or metal molds prepared in the ordinary way for the casting of high quality copper alloys. In casting, the metal is clean and fluid and can be cast in thin sections which take the impression of the mold well. It is quiet in the mold and sets rapidly, having a short freezing range of 50 deg. C, thus minimizing possible segregation. It appears to be resistant to oxidation. Castings removed when red-hot from the sand do not scale in air. The sand castings have good surfaces and can be cleaned readily, for many applications without sand blasting.

Mechanical Tests on Sand Cast Bars

No. of bars	Yield Point	Ultimate Stress	Elongation	Fracture
7	23,500 lb. sq. in.	47,500 lbs. sq. in.	10% in 2″	Fine
	27,800 lb. sq. in.	49,300 lbs. sq. in.	13% in 2″	Grained

The sand cast test bars were all sound and no defects or porosity were revealed during the machining.

Forging

P. M. G. Metal can be readily forged hot. A 3″ chilled cast round billet was heated to redness and forged under the hammer to a 1″ square section. The metal forged without difficulty and no sign of cracking could be detected in any stage. The bar was allowed to cool further and one end was forged at a black heat to 0.88″ section. During this operation the metal was hard and a large number of blows was required, but no cracking occurred. The bar forged at a red heat from 3″ to 1″, gave the following in mechanical tests:

Yield Point	Ultimate Stress	Elongation
56,500 lb. sq. in.	77,950 lb. sq. in.	34% in 2 in., Cup fracture silky
45,900 lb. sq. in.	76,200 lb. sq. in.	42% in 2 in., Cup fracture silky

After forging at a black heat:

Yield Point	Ultimate Stress	Elongation
82,650 lb. sq. in.	94,000 lb. sq. in.	17% in 2 in., Cup fracture silky

Variations are due to finishing temperatures. The properties of the bar hammered at a black heat, however, showed that the metal does not become brittle even when the finishing temperature is very low.

Brinnell Tests

"A series of Brinnell tests on sand cast and forged material gave the following results:

Condition of Material	Brinnell	
Sand cast	104—109	107—121
Forged	126	143
Forged (finished cold)	153	149

Density

"The density of cast specimens was found to be 8:45 and on material hot forged from 3 in. to 1 in. square was 8:44. This exceptional agreement indicates that the cast material is quite sound.

Extruded Bars

"Extruded bars were nicked round and broken. The fracture

revealed an excellent silky fracture without any trace of lamination or defect.

"The values given above are for the particular alloy made up with 10 per cent of hardener and 2 per cent of zinc. Suitable modifications in these properties may be made to meet the varying requirements of particular practice.

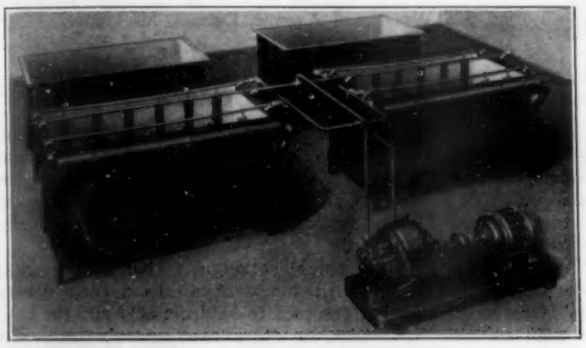
"If I were to attempt to list the various materials which may be made from the alloy I would only be reciting a catalog of the present uses of brasses and bronzes. It can be used in steam plants, valve bodies and spindles forged and cast valves and valve seats, glands, bushings, worm wheels, etc., are used under 160 lbs. per sq. in. pressure, and under saturated steam conditions up to a total heat, including super heat, in the region of 540 deg. F. It is exclusively used at the Vickers-Armstrong Works for bearings, cylinder linings, branch pieces, valves and valve bodies where the pressure in the molds is 1,500 lbs. per sq. in.

"In Hydraulic pressure applications good results have been obtained by comparison with Admiralty gun-metal."

New Electrochemical Cleaning Process for Metals

The Bullard-Dunn electrochemical cleaning process for removing scale and oxides from surfaces of metals has been announced by the Bullard Company, Bridgeport, Conn. This new process is said to clean metals without pitting, etching or causing hydrogen embrittlement, while producing a surface that is resistant to corrosion and also ready for electroplating with nickel, copper, chromium or other deposits. The process is capable of reaching recessed surfaces said to be inaccessible to other methods of cleansing. A feature claimed for process is the fact that while it will produce perfectly clean surfaces, it cannot attack the original base metal regardless of the period of immersion. Furthermore, the process deposits on the cleaned surface a coating of homogeneous metal while cleaning it.

The Bullard-Dunn process, according to the company's announcement, is a method of cleaning metals by the action of hydrogen electrically liberated at the cathode in an aqueous solution. Since a coating is applied at the same time, it is stated, the surface is protected at once from pitting, etching or embrittlement. Only the scale, oxide or other foreign matter is removed. The process has been in use at the Bullard plant for several years. Recently it has been installed in several other plants under license. Its development was in connection with the manufacture of bumper bars for automobiles. These bars were cleaned and subsequently plated, and the cleaning process is stated to have proven very economical as well as thorough. Savings were made in time and labor, the subsequent polishing having been made easier and the wheels used for polishing given longer life. The electroplated finishes were also improved, it is claimed, since they were found to be practically impervious to salt spray tests of the Bureau of Standards.



Bullard-Dunn Electrochemical Metal Cleaning Equipment

The process has been applied to a number of products other than bumper bars. Among these are forgings and heat-treated alloy steels for Bullard vertical turret lathes and other equipment. Here again large savings were effected, according to the Bullard Company. It is claimed that the number of men required for cleaning these parts has been reduced from 20 or 25 to two, the large number having formerly been necessary for sand blasting, scratch brushing, filing, rubbing with emery, retapping of threaded holes, etc. Original contours of parts such as gear teeth, splined shafts, keyways, screws and nuts, etc., are retained through the process in their original dimensions. The process exposes defects, it is stated, making easy the rejection of "ruptured" or cracked castings, seamed bar stock, etc.

The process handles all sizes of products and parts in forging, machining, stamping and general metal production. It is especially recommended where scale is encountered, since removal of such scale saves dies and cutting tools. Its value as a preliminary to electroplating is also stressed. It is said to provide the perfectly clean surface necessary for high quality electrodesposited finishes. The coating which it puts on the work while cleaning it is stated to be an ideal undercoat for electroplate.

Among its other uses are named the removal of oxides which tend to form on stainless and rustless steels during fabrication, which are said to be particularly destructive of dies, and also prolong the time necessary for polishing; removal of "rolled in" inclusions which tend to cause corrosion of finished and polished surfaces; general descaling of non-ferrous and ferrous metals.

A variety of solutions have been developed for various metals. The equipment used with the process includes a source of low voltage current; a tank or series of tanks having steam, water and electrical connections; ventilating system for removal of fumes and gases which are said to be no detriment to health although their removal makes for greater comfort of operators.

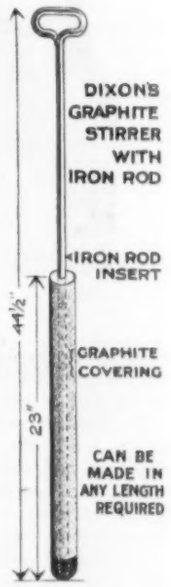
The process is being offered under a license charge and royalty fee by the Bullard Company.

Iron-Cored Graphite Stirrer

An improved stirrer for mixing molten metals has been placed on the market by the Joseph Dixon Crucible Company, Jersey City, N. J., manufacturers of a large variety of graphite products for the metal melting and other industries.

The new product consists of a new graphite stirrer 23 inches long, with an iron rod inserted, forming a handle which brings the overall length to 44½ inches. The iron rod extends the full length of the graphite, which is two inches thick. These stirrers can be made in any lengths specified, and graphite renewals are also supplied for use with the iron rods, which last indefinitely.

The use of a graphite stirrer is known to be a superior practice to that of using simply an iron rod, as the latter has a tendency to contaminate metals other than iron. With the graphite stirrer, foundrymen find that the traces of iron sometimes found in metals stirred with iron rods are eliminated insofar as they are caused by the stirring implement.



Revere Advertisement Wins Harvard Award

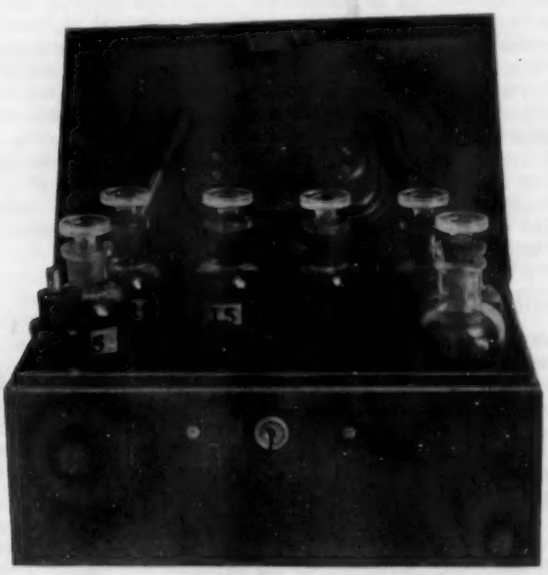
The advertisement of Revere Copper and Brass Incorporated entitled "The Smoke Marks Paul Revere's Foundry," received the Harvard award for the advertisement published in 1929 most distinguished for its effective use of typography. More than 12,000 advertisements of prominent companies were entered in this competition, which is conducted every year by the Graduate School of Business Administration of Harvard University. The prize winning advertisement was the second ever published by Revere Copper and Brass Incorporated, a consolidation of six old and well known companies in the copper and brass field. This advertisement was one of a series of six which trace the company's history from the time of Paul Revere, noted patriot and founder of the copper and brass industry in America, to the present day Revere organization.

Determining the Thickness of Decorative Chromium Coatings

Since the inception and wide use of chromium plate, the necessity for some means by which the thickness or amount of actual chromium on the work could be quickly and easily determined has been desired by both makers and users.

It is a matter of common knowledge that decorative chromium plate differs widely in thickness, even when deposited in the same bath, and on similar objects and undercoatings. Many of the industries specify a minimum thickness of .000025" (25 millionths of an inch). In the course of investigations made through the year 1929, the General Testing Laboratories, Inc., of Detroit, Mich, have examined some 250 different samples of decorative chromium work, and state that they have found the plating thickness on 40 per cent to be below 10 millionths of an inch. About 30 per cent would meet the minimum specification. While such a condition is probably responsible for much poor work, when later subjected to influences of wear and corrosion, they believe a large share of the failures can be attributed to too little chromium on the work, or non-uniformity of deposit.

It has been their purpose to develop a means whereby the plater or inspector could easily and quickly determine the amount (thickness) of chromium plate, and a process that would lend itself to control conditions, thus reducing costly rejections and improving the quality of work.



Chromium Thickness Test Outfit

The test set consists of six solutions, marked 5, 10, 15, 20, 25, and 30 millionths, respectively, the markings referring to plating thickness, and covering the range of decorative chromium plating. A simple measuring device is used with these solutions. In addition, a solution for reacting with the plating, is also provided. The test is entirely visual, involving a simple definite color change.

An area of definite size is isolated on the object to be tested. This area may be taken at any convenient place on the object, or at a spot of questionable chrome thickness. This is done by using a rubber gasket (an assortment of which are provided with the set), and applying a grease to one side of the gasket, which is then placed on the object, the grease forming a waterproof seal.

If the plating to be tested is to meet a minimum specification of 20 millionths of an inch, the solution marked "20 millionths" is used, and it, together with the reacting solution is added to the test area inclosed by the gasket. If the plating is 20 millionths of an inch (or over) in thickness, a definite color change takes place, the solution changing from black to white (colorless). If the plate is less than 20 millionths of an inch in thickness, no color change occurs, and the test spot remains black. If such be the case, and the actual thickness is desired, the test is repeated, this time using the "15 millionth" solution, and in case that too remains black, the test is again made using the "ten millionth" solution, until the solution finally used will turn colorless. In case the "15 millionth" solution had remained black, and our "ten millionth" had turned colorless, the plate is between 10 and 15 millionths thick.

These tests can be carried out very quickly, 2 minutes being sufficient to allow for completing the test and, in some cases, when no idea is in mind as to the approximate thickness of the plate, all six solutions, covering the entire range can be used and the test completed well within 10 minutes. However, as is customary in control work when some definite specification is required, which means using the single test solution corresponding to that specified thickness, the resulting color, if black, shows the plate to be below specification, whereas if it becomes colorless, it is above.

The test is entirely independent of the undercoating. Nickel, copper or brass as undercoatings, regardless of their thickness, do not interfere. The object is not destroyed or pitted in any way, the chrome alone being affected. The work may be stripped and replated without showing the presence of the test spot. The test may be carried out anywhere, the entire apparatus being self-contained and portable.

Many tests may be carried out on the same piece, for purposes of studying the throwing power of the bath. As an illustration of the small area required, 12 separate tests can be carried out on a 2 by 4 inch surface.

The surface need not be flat. The Chrome Tester will apply to any surface of moderate curvature, and can easily be adopted to such articles as screws, bolts, etc.; modifications are obtainable that can be used on almost any conceivable shape or object. Full information on the test may be had from the General Testing Laboratories, 525 Woodward Avenue, Detroit, Michigan.

New Type Gas Generator

A new type of gas generator, designed by William R. Minrath, New York, has been placed on the market by the U. S. Stoneware Company, 50 Church Street, New York. The equipment has been developed with a view to simplicity and ease of operation, the company states. Patent applications have been made covering the basic principles involved.

The outfit consists of a single rectangular chemical stoneware body which is divided into two compartments by a vertical partition. One compartment is designed to hold the acid and the other, the solid sulphide, carbonate, or other reacting substance. This reagent is supported on a removable perforated plate of chemical stoneware. The acid enters through holes in the partition wall and reacts with the solid, producing the desired gas. The cover on the gas compartment is ground on and made gas-tight by the application of vaseline or other grease, the usual practice in chemical laboratories for desiccators and similar equipment.

New Gas Generator

The supply of gas is automatically regulated by the pressure, which forces the acid out of the reagent compartment whenever the gas is being generated too rapidly. When the charge of acid becomes exhausted, it is drawn off by means of a chemical stoneware faucet. The cover on the acid compartment may then be lifted and a fresh supply added. When the charge of solid is consumed, the cover is removed from the reagent compartment and refilled.

Since the chemical action disintegrates the impurities present in commercial varieties of sulphides, carbonates, etc., the action of the new gas generator is said to be self-cleaning, for these impurities drain through holes in the stoneware supporting plate.

The "U. S. Standard" gas generator was designed to meet the demand in present day laboratories for a ready source of such gases as hydrogen sulphide, carbon dioxide, hydrogen, chlorine, etc.

A total of five standard sizes will be offered. Provision has been made to satisfy all pressure and capacity requirements.

New Aluminum Coating Process

A new process for coating and decorating aluminum and its alloys electrolytically is announced by the Metals Protection Corporation, Indianapolis, Ind. The process, known as "Alumilite," produces either silvery white or various colored finishes, such as a variety of shades of blue, yellow, red, brown, green and purple. The company summarizes the properties of the coating as follows:

Adhesion: This coating is an integral part of the aluminum itself. It will not crack, chip or peel off. Treated sheets may be stamped and formed into such shapes as camera bodies, soap dishes, ash trays, hub caps, etc., without marring finish.

Corrosion Resistance: Unusual resistance to atmospheric and salt water corrosion, hot water or steam. It is not recommended for use in protecting aluminum from acids and alkalis. It is effective against the corrosive action of certain chemicals. Where its use is contemplated for the prevention of chemical action, specific information will be furnished upon request.

Wear Resistance: Standard "Alumilite" coating shows more resistance to wear than a heavy nickel plate. Comparative test of the resistance to abrasion may be made on a stitched buffing wheel, using a nickel buffing composition.

Hardness (Scratch): "Alumilite" will not withstand cutting by a sharp pointed instrument, but does offer considerable resistance to same. A blunt instrument will force the coating into the softer metal beneath without rupturing. Its resistance to scratching is another indication of hardness, and has been measured by the Bierbaum apparatus. According to such measurements, a hardness equivalent to that of an intermediately hard steel is shown.

Heat Resistance: Aluminum melts at 1216.4° F. Alumilite has a melting point in excess of this temperature. A treated sheet of aluminum can be heated until the aluminum within the coating melts, while the coating itself remains intact. The usual colored finishes resist temperatures under 500° F. Colors are being developed to resist higher temperatures.

Heat Absorption: "Alumilite" in black or other dark colors shows marked increase over ordinary aluminum in the absorption of heat. Tests show that water in an aluminum kettle, with the bottom colored black, will boil in one-half the time required in a plain aluminum kettle, under exactly the same conditions.

Fastness of Colors: Over sixty colors have been subjected to fadeometer tests by several testing laboratories. While certain colors were found unsuitable because of lack of fastness, they have found a group of varied colors which will not fade.

Discoloration: Since "Alumilite" itself is hard and does not tarnish, it will not injure or discolor other articles with which it comes in contact. This quality is particularly advantageous on such articles as serving trays, compacts, spectacle frames and cases, etc.

Effect of Treatment on Physical Properties of the Metal: There is no application of heat in the process higher than 100° C.; consequently there can be no annealing or warping of the base metal. There is a slight weight change during treatment, which varies with the alloy composition. For exacting work, it would be safe to assume a decrease in strength equivalent to a decrease in thickness of not over .001 in. for material treated on one side only, or twice that for both sides.

Multi-color Finishes: Two or more colors may be applied to a surface or if desired, it is possible to obtain multi-tone effects.

Lacquer Finishes: The treated aluminum surface will absorb certain lacquers as well as oil. It is therefore a good base for such materials.

Cost of Installation and Operation: The installation cost will ordinarily be less than eighty per cent of the usual cost of nickel plating plant of like capacity. The operating cost will range from thirty to seventy-five per cent of the cost of nickel plating. Aluminum articles free from grease do not have to be cleaned, neither are they buffed after treatment.

Service: Company lays out plants, supervises installation, instructs operators in all necessary details, prepares cost estimates and production schedules, etc. For the manufacturer whose production is not sufficiently great to warrant installing a unit the company is prepared to take care of such requirements at our nearest job shop.

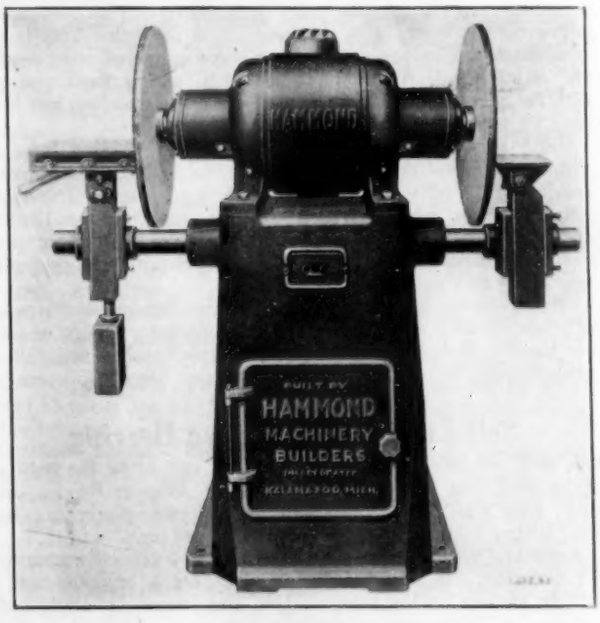
With regard to the uses of the finish, the company lists a great many, such as for cameras, instruments, novelties, smoking equipment, electrical, optical, automotive goods, signs, tags, tennis rackets, etc. Applications for purely decorative purposes are too numerous to mention. Due to its corrosion resisting properties, it is stated to be excellent for marine fittings, aluminum shingles, airplane parts, etc., subject to severe atmospheric conditions.

Stampings can be made of sheets coated by the "Alumilite" process, since it will withstand a rather severe drawing operation, according to the company. Hardness of the coating is stated to make for wear resistance. The coating is also stated to be an excellent electrical insulator and is suggested as suitable for coating aluminum wound motors, electro magnets, etc.

New Double Disc Electric Grinders

A new line of electrically driven double disc grinders has been placed on the market by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. (formerly Hill-Curtis Company). These machines are being supplied to operate discs of 12 and 24-inch diameters, from 3 to 10 horsepower. The company gives the following description:

Machine has totally enclosed sealed motor, but cooled by fan mounted on the spindle. All incoming air must pass through the air cleaner which is mounted directly in back and connected through pedestal to cored end bell. Clean cool air is drawn through the motor air cleaner, through the motor windings, at the same time discharging the warm air through outlet in pedestal. By elimination of emery, grit, and dust a clean cool power unit results, reducing maintenance to a minimum. Motor is especially designed for the service, having high overload capacity, and operates at less than 40 deg. temperature rise. It is capable of withstanding severe momentary shock without excessive heating.



Double Disc Grinder

The spindle is unusually large, made of chrome nickel steel, ground and balanced to insure smooth operation. Bearings are unusually large and especially designed to take care of both radial and lateral thrusts.

The discs are machined on both sides and reversible so that two disc wheels can be mounted at one time. After one is worn the disc can be reversed, and in this way the disc renders twice the amount of service hours with one operation of changing and

mounting disc wheels. Standard equipment includes one plain table and one lever feed table as shown. This machine can also be supplied with either two lever feed tables or two plain tables.

Push button control is conveniently mounted in the front of the pedestal and mounted in recess to protect it from accidental starting. Cutler-Hammer automatic motor starter with overload protection, low voltage protection, and phase failure protection are standard equipment. It is mounted on the door of the pedestal and is convenient for resetting the overload relay.

Sectional Scratch Brushes

A new type of scratch brushes for use on metals and various finishes has been placed on the market by The Boissier Electric Corporation, 100 Walker Street, New York City, who are the sales distributors. The brushes are manufactured by the Newark Brush Company, Newark, N. J.

These brushes are supplied in sections which can be mounted by the machine operator to make a wheel as wide as desired, or as solid brushes of any thickness, made up of sections at the factory. They are composed of crimped brass, steel or nickel silver wire in various sizes ranging from .00225 in. in diameter to .008 in. and larger. The brushes are produced by specially designed and patented machines, which, as far as can be ascertained, are the only ones of their kind in use in this country.

New Sectional Scratch Brush

The machines make brushes with a maximum of wire on a hub of minimum size, securely fastening the wires around a solid steel ring, the maker states. Lead centers are supplied for using the brushes on tapered spindles. The design permits just enough play to prevent the wires from breaking off at the hub. This is said to eliminate a disadvantage found in wooden-hubbed wire brushes. The metal hub, furthermore, cannot split and is flush vertically with the wires, an important feature since a protruding hub has a tendency to mar the work, they state.

Metal hubs are smaller in diameter than wooden hubs for brushes of equivalent diameter, so that the operator has a greater wearing depth of wire on the metal-hubbed brush. The maker estimates from results already obtained, that the metal-hubbed brush has about 30% more life than the older type. Mechanical pressure in making the brushes fastens the wires tightly, preventing their being torn out.

Certain finishes are obtainable with these brushes which cannot be produced with any other type, it is claimed. Among these is mentioned a fine soft satin finish. Sample brushes and full information can be obtained from the Boissier Electric Corporation

Self-Lubricating Bronze Bearing

A new self-lubricating bronze bearing, said to be the only one of its kind, has just been announced by Johnson Bronze Company, New Castle, Pa., makers of bronze bushings, bronze bearings, bronze castings, cored and solid bar bronze.

According to P. J. Flaherty, president and general manager of the company, the new bearing provides for a uniform area of bearing surface on the pressure line, and insures an efficient distribution of lubricating compound. The compound used is also a Johnson Bronze Company development.

The improved results are said to be obtained by a new method of effecting indentations in the metal and by placing them on an angle of 30 deg. Patent covering this method has been applied for.

Much interest has been evinced already, especially by the makers of machinery and parts subject to intermittent or periodic operation, such as brake levers, clutch levers, shock absorbers, rocker arms, slow running journals, starting motors, landing gears, guide rollers, sliding door rollers and the like.

New Decorative Lacquer Finish

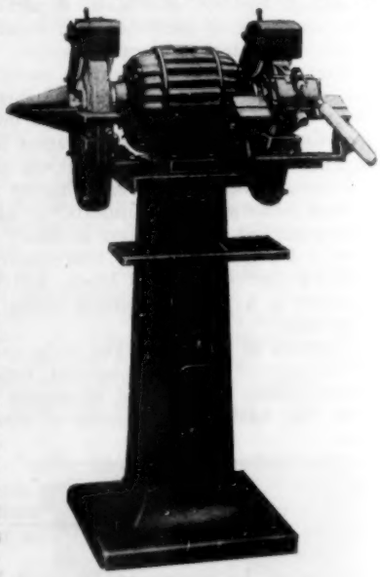
A new and interesting decorative finish in clear lacquer has been introduced under the trade name "Prismlac," by Maas and Waldstein Company, Newark, N. J. Its simplicity of handling by ordinary spray methods and the beautiful decorative effects obtained on smooth surfaces show promise of very wide application, the makers state. Clear, colored or bronze finishes may be obtained. "Just spray and watch it crystallize" is the description given by manufacturer.

The fact that "Prismlac" air dries in about one hour gives it a decided advantage over baking finishes, it is claimed. In comparison with a three-coat crackle finish, it shows a decided saving in material and labor as well as providing a novel finish. In solid colors it is said to have the advantage of entirely obliterating, in one spray coat, such defects as drawing marks, spot weldings or file marks on stamped steel parts, for example, on radio chassis and cans.

Clear "Prismlac" is used on polished metal articles and novelties to make them attractive. Full information and details on its application to any particular product may be obtained from Maas and Waldstein Company.

All Purpose Tool Grinder

The J. G. Blount Company, Everett, Mass., have produced an all purpose tool grinder that is said to be highly adaptable for either the wood shop or the general shop. This grinder is driven by a 1 hp., 1750 rpm. fully enclosed, dust-proof motor built by the Westinghouse Electric and Manufacturing Company. To accomplish the many differing needs of service, it is provided with three wheels. A coarse wheel, 10 inches by 1½ inches, is for general shop use and on this all snagging or rough grinding can be done. A fine wheel of the same size is provided for the grinding of tools, chisels, plane irons, etc. To facilitate these last operations, this wheel is provided with a special rest, fully adjustable as to angle with wheel face, to which is fitted a screw-feed sliding-clamp block for holding the tool and guiding it squarely across the wheel. This attachment assures the rapid grinding of tools to correct angle and curvature. For the grinding of gauges and inside curved tools, a grinding cone in provided.



New Tool Grinder

Machine is of motor-in-head type; spindle is extra heavy and runs in heavy duty deep groove ball-bearings. Double recessing of flanges constitutes seal against grit and dust entering either the bearings or the motor. Westinghouse motor is of special design for this service, and operates with exceptionally low-current consumption. The wheels are fitted with fully-enclosing, approved safety guards that are fully adjustable to wheel wear. The tool rests are also adjustable.

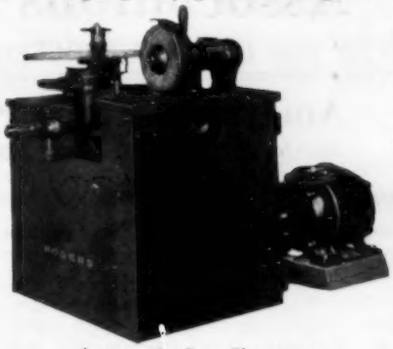
Aluminum Wall Covering

An embossed aluminum foil wall covering to harmonize with modernistic furnishings has been put on the market by the Reynolds Metals Company, Louisville, Ky., manufacturers of metallic foil, including tin, lead, zinc and aluminum. The new product is being manufactured in a wide variety of designs and besides being comparatively inexpensive can be washed and painted, the makers state. The new material is known as "Metal-Craft" and distribution will be through jobbers and department stores.

Automatic Saw Sharpener

Samuel C. Rogers and Company, Buffalo, N. Y., has placed on the market a new full automatic circular cross cut and rip saw sharpener. It is also used on metal cutting saws. This machine is stated to be of extremely simple construction. It embodies five new features: "SKF" ball bearing grinding wheel spindle; metal cabinet enclosing all working parts; automatic jointing device for keeping saw teeth in perfect alignment and the saw round and true; positive adjustments for maintaining the same degree of bevel the entire length of grinding; full automatic for cross cut saws with bevel faced teeth up to 40 deg. bevel, as well as for rip saws.

The main frame, pulleys, chuck, etc., are of special mixture of steel and iron, the makers state. The cabinet is of heavy sheet metal. All cams, gears and wearing parts are hardened. The grinding wheel spindle is mounted on ball bearings. In the housing adjacent to the grinding wheel a deep groove heavy duty spindle bearing is used to eliminate end play. In the other housing a self-aligning deep groove bearing is said to automatically compensate for any slight misalignment.



Automatic Saw Sharpener

Its capacity is for saws from 3 to 30 inches in diameter with teeth from 10 points to the inch up to 2¼-inch teeth spacing. The grinding speed is 30 to 40 teeth per minute, depending on size of teeth. Once started, no further attention is required, the makers claim. It can also be operated as a hand machine.

Equipment and Supply Catalogs

General Electric Company, Schenectady, N. Y. Thirty-eighth Annual Report—1929.

Dies. Wrigley Brothers, 356 West 18th Street, New York City. Calendar advertising paper-cutting dies, etc.

Welding Wire Research. Page Steel and Wire Company, 230 Park Avenue, New York City. Welding information.

Isolation. Korfund Company, Inc., 235 East 42nd Street, New York City. Publication on sound-proofing of buildings and isolation of machine vibration.

Hytempite in the Foundry. Quigley Furnace Specialties Company, Inc., 56 West 45th Street, New York. A 12-page pamphlet on plastic refractory material.

Welding Rods. Fusion Welding Corporation, 103rd Street and Torrence Avenue, Chicago, Ill. Circular on "Weldite" rods for various types of arc and acetylene welding.

Industrial Cleaning of Metal. The J. B. Ford Company, Wyandotte, Mich. A booklet giving considerable information on metal cleaning; covers the use of "Wyandotte" cleaners.

Pulverizing Mills. The Fuller Lehigh Company, Fullerton, Pa. Circular 902, a 4-page leaflet on air and screen separation types of pulverizing mills for rock products and other materials.

Grammes Metal Products. L. F. Grammes and Sons, Inc., Allentown, Pa. Catalog of a wide variety of metal specialty products, together with a description of the Grammes plant; 112 pages.

Lionite Polishing Grains. Charles F. L'Hommedieu and Sons Company, 4521 Ogden Avenue, Chicago, Ill. Leaflet on a line of General Abrasive Company products sold by the L'Hommedieu firm.

Automatic Temperature Controllers. Wilson-Maeulen Company, Inc., 730 East 143rd Street, New York. Booklet describing an inspection tour of industrial plants using automatic temperature controllers.

Notes on Uses of Nickel Cast Iron. The International Nickel Company, 67 Wall Street, New York. An excellently arranged handbook giving a good deal of information on the applications of nickel cast iron.

Brown Remote Type Instruments. The Brown Instrument Company, Philadelphia, Pa. Catalog No. 7501; remote type indicating and recording apparatus for measuring pressures, liquid levels, flows and for indicating positions.

Properties of Haynes Stellite. Haynes Stellite Company, Kokomo, Ind. The first of a series of booklets on "Stellite" and products made of this alloy, which is said to have 75 per cent more red hardness than other ferrous alloys.

The Polytechnic Institute of Brooklyn. Bulletin of the Evening Session; includes courses in chemical, civil, electrical and mechanical engineering, chemistry, physics, mathematics, etc. Address, 99 Livingston Street, Brooklyn, N. Y.

Buffing and Polishing Supplies and Equipment. Frederick B. Stevens, Inc., Detroit, Mich. A new catalog, 32 pages, illustrated, describing this company's line of buffing compositions, polishing lathes, automatic polishing equipment, etc. Of interest to all plants where plating, polishing, buffing, etc., are done.

Auction Sale. Industrial Plants Corporation, 25 Church Street, New York. Catalog of sale of The F. B. Stearns Company, Cleveland, Ohio, including automobile and engine manufacturing equipment, to take place April 8, 9 and 10, 1930. All to be sold piece by piece.

Hardness Testing. Wilson-Maeulen Company, Inc., 730 East 143rd Street, New York City. Pamphlet describing and illustrating a method of precision hardness testing on a production basis for industrial metal working plants, by the use of the Rockwell hardness tester.

Lathes. South Bend Lathe Works, 409 East Madison Street, South Bend, Ind. Bulletin No. 9, describing a 9-inch precision lathe for general use; and No. 15, covering a 15-inch lathe of similar design. Also, **General Catalog 91-A;** 108 pages, illustrated; describes all types of South Bend lathes.

Quigley Acid-Proof Cement. Quigley Furnace Specialty Company, Inc., 56 West 45th Street, New York. A 24-page pamphlet on a cement used in masonry where hot or cold acid gases are handled, including acid storage tanks and vats, pickling equipment, floors where acids are used, etc.

Galvanometers. Leeds and Northrup Company, Philadelphia, Pa. Catalog 20; 40 pages, illustrated. This company has also issued: **CO_2 Meters (Electrical),** a 24-page illustrated booklet; **Power Cable Fault Bridge,** an 8-page illustrated pamphlet; **The Homo Method Applied to Nitriding of Steel,** a 12-page illustrated pamphlet.

The Automatic Buffing Book. Automatic Buffing Machine Company, 222 Chicago Street, Buffalo, N. Y. A 31-page pamphlet on the subject of automatic buffing, describing articles that can be automatically buffed, how it is done, and giving many fine illustrations which help to demonstrate the work and operating procedure. The back of the book is devoted to a catalog of the company's automatic machinery of various types.

Electrical Service Parts. Official Universal Catalog of Genuine Electrical Service Parts, 1930 Edition. Published by the Automotive Electric Association of Cleveland, Ohio. The contents include the following: Car application table (passenger car section); motor truck, bus, tractor and miscellaneous section; magnetos. Ninety-five per cent of the principal motor cars, trucks and buses manufactured since 1924 are listed in this catalog, and all of the principal automotive electrical equipment manufacturers have contributed.

Nielsen Surveys. A. C. Nielsen Company, Chicago, Ill. This company has issued the following: Nielsen Survey Index for March; Surveys of Use of Thwing Pyrometers in Plant of National Bearing Metals Corporation, and in Plant of Elliot Company; Survey of Use of Monel Metal for Pump Rods and Other Equipment by Fox River Paper Company; Survey of Use of Calorized Tubes in Dubbs and Cross Stills by Indian Refining Company. Full information in regard to these surveys can be obtained from the Nielsen Company.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Foundrymen's Association

HEADQUARTERS, 222 WEST ADAMS STREET, CHICAGO, ILLINOIS

Convention Plans Maturing

Plans for the 1930 convention and exhibition of the American Foundrymen's Association, which will open on May 12 and run through May 16, at the Cleveland Public Auditorium, Cleveland, Ohio, are being rapidly formulated. A tentative program showing a great variety of papers, round table discussions, shop operation courses, plant visits and also many social functions has been issued. A wider scope has been given the many features than ever before. The convention and exhibition are being held in the same group of buildings, facilitating the movement of foundrymen from session to session and around the exhibition, which will mean a great saving of time.

Cleveland is well supplied with hotels giving excellent accommodations, and foundrymen who plan to attend should have no difficulty in making reservations if they act early. Application blanks for hotel accommodations may be had upon request to the Association at the address above. Reduced rate railway tickets will be available to those who wish to attend the convention. Full information as to certificates for these is obtainable from headquarters also.

The Cleveland Committee on Arrangements is making everything ready. It is planning the plant visits and the entertainment activities, with special attention to a program of ladies' activities for convention week. There will be a reception and dance the evening of May 12, the Exhibitors' Dinner, May 13, and the A. F. A. Subscription Banquet on Thursday evening, May 15. The local committee is composed of Cleveland foundrymen and their wives, who have given considerable time to making the preparations for the convention. Walter L. Seelbach, Forest City-Walworth Run Foundries Company, Cleveland, is general chairman of the committee.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Conference on Research Held at Rochester

The conference on research was attended by some 200 or 300 persons, who came to Rochester on March 22 to hear the results of the past year's work in a variety of electroplating problems. They were not disappointed, the reports and papers presented being well worth the trip.

The full executive board of the American Electroplaters' Society was present and there were representatives of branches all over the country, so that the meeting had the appearance of a convention. The discussions that followed the papers indicated the amount of interest being shown in the research work and the science of plating in general. The following papers were presented:

Industrial Plating Problems and Researches

Sylvester Gartland, Chairman

Aviation. M. R. Whitmore, U. S. Air Corps, War Department, Washington, D. C.

Automobiles. W. M. Phillips, General Motors Corporation, Detroit, Mich.

Plumbing Fixtures. Dr. William Blum, Bureau of Standards, Washington, D. C.

Hardware. R. E. Hicks, Yale and Towne Manufacturing Company, Stamford, Conn.

Silverware. F. G. Mesle, Oneida Community, Ltd., Oneida, N. Y.

Report from Research Laboratories

George B. Hogaboom, Chairman

Summary of Researches at Bureau of Standards. Dr. William Blum.

Analysis of Silver Plating Solutions. R. M. Wick, Bureau of Standards, Washington, D. C.

Plating Zinc on Die Castings. E. A. Anderson, New Jersey Zinc Company, New York.

Summary of Researches of Roessler and Hasslacher Chemical Company. C. J. Wernlund.

Summary of Researches in Progress in American Universities. Compiled by Dr. William Blum.

Plans for Research

R. J. O'Connor, Chairman

Report of Research Fund. Phillip Sievering, treasurer.

Support of Research Fund for Ensuing Three Years. Discussion.

Subjects for Research.

Publication of Results.

Electroplate Specifications

In discussion of subjects for research, it was suggested that the matter of specifications for electroplate be taken up. Such a work was declared by many to be a much needed step by the Society, although it is a very big job.

Boston Branch

HEADQUARTERS, CARE OF ANDREW W. GARRETT, 45 KING STREET, DORCHESTER, MASS.

March Meeting

The regular March meeting of the Boston Branch of the American Electroplaters' Society was held Thursday, March 6th, at the American House, Boston, at 8:30 P. M. Communications and notices were read. A letter was received from the Providence Branch secretary regarding a possible visit by a delegation from them at some future meeting. The secretary said that he had written, cordially inviting them to attend any or all meetings and that arrangements would be made to repay the visit, feeling that these inter-branch visits would be a great benefit to both branches and to the society as a whole.

The speaker of the evening was W. W. Chase of the Baltimore-Washington Branch. Mr. Chase first spoke of the National Convention which is being held in Washington this year. He told of the plans and arrangements being made and urged all possible members to attend, clearly pointing out the advantages.

Mr. Chase then continued with his subject, which was "Lacquers." He gave a very excellent outline of the various kinds of lacquers, the constituents thereof, the different methods of application, troubles to be encountered, and the many uses and advantages of lacquers.

The question session proved to be very interesting and lively. The subjects, of course, wandered from lacquer quite often, as such questions do. A rising vote of thanks was given to Mr. Chase for a very interesting discussion, and the meeting was adjourned at 10:30 P. M.

—Thomas Johnson, Secretary.

Bridgeport Branch

HEADQUARTERS, CARE OF W. H. EHRENCRONA, BOX 301, R. F. D. 1, BRIDGEPORT, CONNECTICUT

Annual Banquet and Meeting

The Bridgeport Branch of the American Electroplaters' Society held its annual meeting and banquet on March 8, at the Stratfield Hotel, Bridgeport, Conn. There was a very large attendance at both the session and the banquet, the latter event

bringing together more than 200 persons. As usual, the arrangements were perfect and everyone had a very fine time. The committee is to be highly complimented on its very excellent handling of the affair.

Program of Papers

The technical session in the afternoon was in charge of R. J. O'Connor, chairman. The following papers were heard:

Anode Rods, by George B. Hogaboom, Hanson-Van Winkle-Munning Company, Matawan, N. J., and an associate editor of THE METAL INDUSTRY, New York.

Nickel Plating to Be Followed by Chromium Plating, by Dr. A. K. Graham, University of Pennsylvania, Philadelphia, Pa., and an associate editor of THE METAL INDUSTRY, New York.

Colors, by Kenneth E. Burgess, technical director, Zapon Company, Stamford, Conn.

Researches on Silver Plating, by Dr. E. B. Sanigar, Weston Fellow of the American Electrochemical Society at Columbia University, New York.

Nickel Plating on Aluminum, by Dr. Harold K. Work, Aluminum Company of America, Pittsburgh, Pa.

Milwaukee Branch

HEADQUARTERS, CARE OF JOHN N. HOCK, 1229 WEST 24TH STREET, MILWAUKEE, WISCONSIN

The Milwaukee Branch of the American Electroplaters' Society will hold its annual educational session and banquet on April 26 at the New Schroeder Hotel, Milwaukee. The session will take place in the afternoon and the banquet in the evening.

The program for the educational session has been arranged as follows:

Plating Room Engineering, by P. J. Lyons, courtesy of Hanson-Van Winkle-Munning Company, Matawan, N. J.

Chromium Plating on a Large Commercial Scale in Modern Production, by Jacob Hay, C. M. Hall Lamp Company.

Electroplating on Aluminum, by Harold K. Work, Aluminum Research Laboratories.

Round Table Talk and Discussions, with Slides, by Fred Liscomb, courtesy Hanson-Van Winkle-Munning Company.

Hydrogen Pitting and Peeling in Nickel and Cyanide Copper Solutions, by Charles H. Proctor, Roessler and Hasslacher Chemical Company, New York.

Lacquering, by Edward H. Bucy, Brevolite Lacquer Company.

The banquet committee reports that the affair will be a fine one. These matters were all discussed at the last meeting, March 13. The coming annual convention of the Society and the Research meeting at Rochester were also brought up for discussion.

Newark Branch

HEADQUARTERS, CARE OF GEORGE REUTER, BOX 201, NEWARK, N. J.

Annual Banquet and Educational Session

The Newark Branch will hold its annual educational session and banquet on April 26, at the Elks' Club, 1048 Broad Street, Newark, N. J. The session will start at 2:30 P. M., and the banquet at 7 P. M. Complete program will be published in our next issue.

Educational Program

The educational session is open to all who are interested in electroplating. A number of interesting papers and discussions will be heard, as follows:

Study of Silver Solutions for Electroplating, Illustrated. By Dr. E. B. Sanigar, Weston Fellow, American Electrochemical Society.

Four Factors Governing the Plating of Rolled Zinc and Zinc Base Die Castings. By Edmund A. Anderson and Claude E. Reinhard, New Jersey Zinc Company of Pennsylvania.

Colors. By Kenneth E. Burgess, chief chemist, Zapon Company, Stamford, Conn.

Ancient Bronzes and Their Restoration, Illustrated. By Dr. Kenneth Graham, Chemical Engineering Department, University of Pennsylvania, and an associate editor of THE METAL INDUSTRY, New York.

Banquet

The banquet will be the usual sumptuous affair and reservations should be made early by addressing the chairman of the committee, George Reuter, 25 Forty-fourth Street, Maplewood, N. J.

New York Branch

HEADQUARTERS, CARE OF J. E. STERLING, 2581 46TH STREET, ASTORIA, LONG ISLAND, N. Y.

A regular meeting of the New York Branch of the American Electroplaters' Society took place Friday evening, February 28, at 611 World Building, New York, the regular meeting place. All officers and many other members were present. A good part of the time was taken up in examination of new applications, of which there are very many coming in.

Frank MacStoker, chairman of the banquet committee, reported that the banquet this year was a complete success.

On March 14, there was another regular meeting, with all officers again present but fewer of the other members. However, there was much good discussion of various subjects, including the charts of simplified methods of chemical control as arranged by Dr. L. C. Pan; matters of advertising and choosing of delegates to the research meeting at Rochester.

CHARLES HAUSHALTER, Recording Secretary.

American Zinc Institute

HEADQUARTERS, 60 EAST 42nd STREET, NEW YORK CITY

New Offices

The American Zinc Institute has announced the removal of its offices from 27 Cedar Street to Suite 1562, Lincoln Building, New York City. The new address is 60 East 42nd street, as shown above. The Lincoln Building is located immediately across 42nd Street from Grand Central Terminal, with direct entrance to the Lexington Avenue and cross-town subways. Out-of-town visitors will find it more conveniently accessible than the former offices, the Institute states.

Annual Meeting in April

The annual meeting of the Institute takes place this year at the Statler Hotel, St. Louis, Mo., April 14 to 16, inclusive. The program includes the following papers:

Zinc in Galvanizing, by George A. Charls.

Zinc in Brass, by William A. Willis.

Rolled Zinc Products, by a speaker to be announced.

Zinc in Die-Casting, by Robert M. Curts.

Value of Research in Non-ferrous Metals, by Dr. H. W. Gillett.

American Welding Society

HEADQUARTERS, 33 WEST 39TH STREET, NEW YORK

Annual Meeting April 23-25

The annual meeting of the American Welding Society will take place at the headquarters of the Society on April 23, 24 and 25. There will be a number of interesting sessions on welding, an inspection trip, luncheons, the annual dinner, and meetings of the Structural Steel Welding Committee and the American Bureau of Welding. Various officers' and committee reports will be heard.

Institute of White Metals

HEADQUARTERS, ROOM 1258, 11 WEST 42nd STREET, NEW YORK

Institute to Incorporate

Immediate steps were authorized to incorporate the Institute of White Metals under the laws of the State of New York at a meeting of the Institute held at the Pennsylvania Hotel, New York, on March 18. The meeting also expressed its approval of the restriction of the membership of the Institute to manufacturers in the antimonial lead, solder, babbitt and type metals fields. The future development of the organization is to be left to the board of directors of the Institute. It was resolved that the temporary officers continue until the next meeting and that in the meantime

the Organization Committee be constituted as a Nominating Committee, to submit recommendations for the officers and fifteen members of the Board of Directors. The election of officers and directors will take place immediately after the incorporation of the Institute is announced.

The members of the Organization Committee consist of I. Davis, Marks Lissberger and Son, Inc.; S. Siegel, Nassau Smelting and Refining Company, Ltd.; E. C. Miller, Magnolia Metal Company; Walter Schoenbach, American Lead Company; Jerry Katz, American Metal Company; J. W. Paterson, Hudson Smelting and Refining Company; L. Muscat, United American Metal Corporation.

Western Division

A Western Division of the White Metals Institute was formed at a luncheon-meeting at the Stevens Hotel, Chicago, on March 7. The meeting was called by the temporary officers of the Institute as a result of requests from white metal manufacturers who were unable to attend the organization meeting at New York. The principal speaker at the meeting was Benjamin Schwartz, trade relations counsel of the Institute.

Waste Material Dealers

HEADQUARTERS, 1109 TIMES BUILDING, NEW YORK CITY

Seventeenth Annual Convention

The National Association of Waste Material Dealers held its seventeenth annual convention at the Hotel Astor, New York, on March 18 and 19. There was a large attendance and the various sections of the Association, devoted to many branches of the scrap and waste material industry, held meetings and heard lectures and papers by authorities.

The Metal Division met on Tuesday afternoon, March 18, with Benjamin Friedman presiding. He was re-elected chairman for the ensuing year. A report from the Metal Definition Committee was approved and the committee was continued for another year. Aluminum scrap specifications recently adopted by the Aluminum Research Institute were discussed and a committee was appointed to consider the specifications thoroughly. Formation of a wholesale metal dealers' division was discussed. This division was proposed in order to have a body which could take up matters not of interest to smelters and refiners. This was referred to the board of directors of the Association. It was voted to change the wording of the metal classifications adopted by the Association so that the word "unsweated" should be used in connection with auto radiators; that classification will now be "auto radiators unsweated," rather than "auto radiators." It was voted also to adopt another method of purchasing storage battery plates. Besides the old method, this material will now be purchasable under the Association's rules on the basis of "lead plus antimony, dry, less treatment charge."

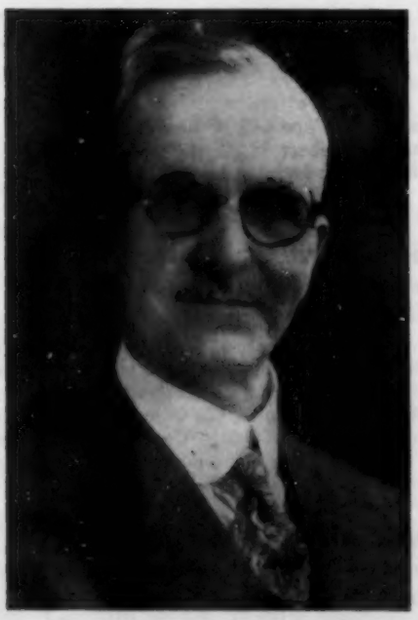
The River Smelting and Refining Company, Cleveland, Ohio, is a new member of the Association.

On Wednesday evening, March 19, the annual banquet took place. American, Canadian and European members were represented and there were many guests as well. Floyd Gibbons, noted radio speaker and war correspondent, addressed the gathering. Another speaker was Sir Frederick McGill of England, a humorist.

Personals

William Herbert Davis

William Herbert Davis, foreman of the burnishing department of the Scovill Manufacturing Company, Waterbury, Conn., recently completed fifty years of service with that company. He has been in charge of the department for more than a quarter of a century; and for twenty-one years previous he was a burnisher in this department.



William H. Davis

Mr. Davis was born January 6, 1865. At fourteen he spent a summer vacation working at the Scovill plant, "stringing on" work in one of the departments. The following year he entered the employ of the company. This was in January, 1880, just about the time of his fifteenth birthday.

The art of hand burnishing, by means of which a very fine and durable finish was applied to brass, required in those days a set of instruments and tools very difficult to obtain. The owner of such a set usually kept it in order to take up the art himself. So that Mr. Davis found it necessary to procure his tools at high cost when the opportunity arose to learn the burnishing art. From Samuel Taylor, a pioneer burnisher, he purchased a set, paying as much as $40 for one particularly fine instrument.

Mr. Davis is a lineal descendant of Abel Porter, founder of the Scovill business and a pioneer in Waterbury industry. His father, William Henry Davis, was in the service of the Scovill company for fifty-three years, and his brother, Eugene J. Davis, retired from the employ of the company eleven years ago, after thirty-seven years of service.

Besides his connection with the Scovill works, Mr. Davis is well known in Waterbury musical circles as an accomplished singer, having studied under a number of excellent voice teachers in New York as well as Waterbury. He has sung in many of the Waterbury choirs, acting chiefly as soloist in the major sacred works.

Rodney Chase, of the Chase Brass and Copper Company, Waterbury, Conn., is in Europe.

C. H. Jensen, formerly with the Byllesby Engineering and Management Corporation, Pittsburgh, Pa., is now on the engineering staff of the Copperweld Steel Company, Glassport, Pa.

Charles Hardy, head of Charles Hardy, Inc., 122 East 42nd Street, New York, dealers in ores and metals, sailed for Europe on the Steamship Majestic on March 14. He will stay abroad several weeks

A. F. Preuster has joined the International Graphite and Electrode Corporation, Niagara Falls, N. Y., recently formed to manufacture electric furnace graphite, carbon electrodes, etc. Mr. Preuster has been engaged at various times with the Carborundum Company, Fitzgerald Laboratories, Inc., and the Republic Carbon Company.

R. I. Van Winkle, for ten years secretary of the Anderson Foundry and Machine Company, Anderson, Ohio, is now manager of the Wandtke Pattern and Foundry Company, 1700 Ohio Avenue, Anderson. This concern specializes in high grade castings and wood and metal patterns and match plates. The shop is new and modern, according to Mr. Van Winkle.

George Giffault, formerly New York district sales manager for the Baltimore Copper Mills, is now district manager at Philadelphia, Pa., for the Baltimore Copper Mills Division of Revere Copper and Brass, Inc. He is assisted there by David **Hickman,** formerly Cincinnati, Ohio, representative of the Rome Brass and Copper Company, Rome, N. Y., now also a part of the Revere corporation.

H. P. Croft delivered an address on March 11 before the

Cleveland, Ohio, chapter of the American Society for Steel Treating. His subject was "The Effects of Lead on the Machinability of Copper and Copper Alloys." Mr. Croft will be metallurgist at the new $5,000,000 plant of the Chase Brass and Copper Company, now nearing completion at Euclid Village, near Cleveland.

Edwin N. Hazlett recently joined the sales engineering department of the Copperweld Steel Company, Glassport, Pa. Mr. Hazlett graduated from the University of Pittsburgh in 1928 and completed an apprentice engineering course with the Duquesne Light Company, and has since been with the distribution department of that company at McKeesport, on transmission operation work.

Walter Smith of Waterbury, Conn., has been selected for the position of general superintendent of the new Cleveland plant of the Chase Brass and Copper Company of Waterbury, which started operations on April 1. The plant, expected to be one of the finest in the country, will employ about 2,000 people. **Frank T. Walsh,** also of Waterbury, heads the sheet metal section. **Frank Selby,** another Waterbury man, is foreman of the casting shop. The general office manager is **T. W. Reinbrecht,** and he is assisted by Harold Smith. The plant's purchasing agent is **E. Hepman**; paymaster is **W. E. Hoofe**; chief metallurgist is **Harry Croft.**

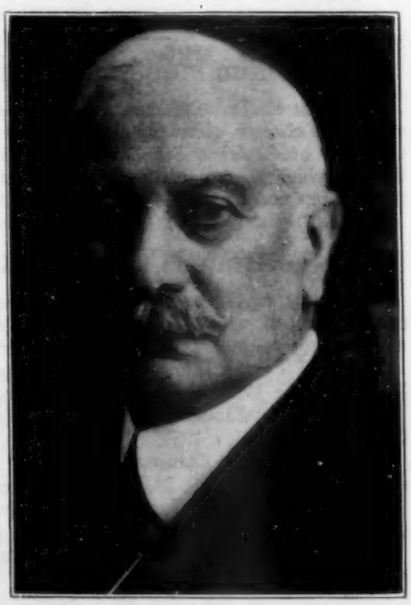
Harry G. Lamker, for seven years foundry manager for the Wright Aeronautical Corporation, Paterson, N. J., is now in charge of the foundry work of the Alloys Foundry Corporation, Paterson, N. J., which is specializing in aeronautical castings (see page 196). Mr. Lamker is also secretary-treasurer of the company. He graduated from Carnegie Technical Institute as a metallurgist, and took his first position upon graduation with the General Electric Company, working in its research laboratories on ferrous and non-ferrous metals. Later he accepted a position with the Aluminum Company of America as manager of the foundry at its Detroit plant, remaining there for seven years. He then went with the Johnson Bronze Company as foundry manager, after which he spent seven years in charge of the Wright Aeronautical foundry.

Obituaries

Edward J. Lavino

Edward J. Lavino, chairman of the board of directors of E. J. Lavino and Company, Philadelphia, Pa., died in that city on March 3, 1930, in his seventy-eighth year.

Mr. Lavino was born in Smyrna, Turkey, in 1852, the son of Edward George Lavino and Julia M. Borrell Lavino, and was of Dutch descent. He was educated in private schools in Brussels, and at Antwerp University, and married, on June 23, 1875, in Smyrna, Alma Joly, who survives him. He is also survived by a son, Edwin M. Lavino, of Philadelphia, and four daughters, Mrs. A. Graham Elliot, Jr., Mrs. Lavino Hagar, Mrs. Henry C. DuBois and Mrs. Thomas W. Griffiths, Jr.



Edward J. Lavino

In his early life, Mr. Lavino served with his father's company in Smyrna, Keun-Lavino and Company, who were large exporters of licorice root, fruits, emery, manganese ores and other products. In 1887, Mr. Lavino established himself in Philadelphia, under the name of E. J. Lavino and Company, in partnership with his brother, the late Henry F. Lavino and later, also with his elder son, the late E. George Lavino. In a few years, the importation of ores, metals and ferro-alloys overshadowed in importance the other products and the partnership of E. J. Lavino and Company soon became well known throughout the country by all the users of these ores and alloys. Mr. Lavino was the first to import 50% ferro silicon used in this country; he was the first to import the caucasian manganese ore, a sample of which he brought in forty years ago, in a barrel, and from this sample sold to Andrew Carnegie a lot of ten thousand tons. He was the first to import and sell chrome ore in this country.

In 1918, Mr. Lavino changed his company from a partnership to an incorporated company, with himself as president and E. George Lavino as vice-president, and in 1927 he retired as president and became chairman of the board, his younger son, Edwin M. Lavino, succeeded him.

Prior to the World War, all of the ferro-manganese used and sold in the United States was imported from abroad, chiefly from England, and Mr. Lavino was responsible for a great deal of the importation. Due to the war, it became impossible for the steel manufacturers in this country to secure this article from the old sources, and Mr. Lavino immediately acquired blast furnaces at Marietta, Lebanon and Sheridan, Pennsylvania, and Reusens, Virginia, and, with the aid of his son, E. George Lavino, secured the necessary manganese ore, chiefly from Brazil, and started the first independent manufacture of ferro-manganese in the United States, thereby enabling the steel manufacturers of this country to produce the necessary steel for war purposes.

In addition to E. J. Lavino and Company, Mr. Lavino organized and was president, and later chairman, of a number of subsidiary companies, including the Lavino Furnace Company, operating blast furnaces, the Lavino Refractories Company, specialists in chrome, magnesite and silica refractories; the Lavino Shipping Company; Lavino American and Asiatic Company, dealers in tropical products, and Lavino and Company, Incorporated, dealers in rare metals and minerals. He, also, established the European correspondent of E. J. Lavino and Company, Lavino (London), Limited, five years ago, and acted as its president.

Adelbert E. Coleman

Adelbert E. Coleman, Chicago, Ill., manufacturer of ornamental bronze and iron, died on February 13, 1930, in his seventy-second year, at his home in Chicago. Mr. Coleman founded the Chicago Ornamental Iron Company, Chicago, in 1893. For the past fifteen years he operated this company under his own name. He was at one time president of the Building Construction Employers' Association, Chicago, and of the National Association of Building Trades Employers. Years ago he was active in the Building Contractors' Council. He was one of the organizers of the Builders and Manufacturers Mutual Insurance Company, of which he was director at the time of his death.

Mr. Coleman is survived by his widow and a son, B. Ray Coleman, who is identified with his father's company.

Robert E. Hanke

Robert E. Hanke, of the Martin-Copeland Company, Providence, R. I., jewelry manufacturers, died at his home in that city last month. Mr. Hanke was seventy years of age. At one time he was in the jewelry manufacturing business under the firm name of Hanke and Claflin, Providence. He was a native of Germany but came to this country while a young man. He was with the Martin-Copeland Company for forty years. Mr. Hanke is survived by his widow, two sons and a daughter.

News of the Industry

Industrial and Financial Events

Alloys Foundry Corporation Operating

The Alloys Foundry Corporation has leased a plant on McBride Avenue, West Paterson, N. J., where it has 12,000 square feet of floor space in one building and an adjoining building for pattern storage, with 5,000 square feet. There are also two small sand storage buildings and a 15-car garage. Plot is three acres.

Straight line production layout has been arranged, with core room at east end of building, followed by melting furnaces, molding floor, cleaning, sand blast, heat treating, pickling, and shipping sections. Capacity is about 3,500 tons daily. Future building of additional facilities has been anticipated and will not disturb production. The company is installing complete physical and chemical laboratories which will be equipped with Brinnell and Tinius Olsen testing machines. Aluminum Foundry Equipment Company is supplying melting furnaces, Gehnrich core ovens and Tabor molding machines, all new. The company will specialize in aircraft castings but will also do general work for the trade.

Harry G. Lamker, secretary-treasurer of the company, is in charge of the foundry (see page 195). C. P. Brown is president of the company. He was formerly president of the Mitchell Oil Company, which was sold to the Atlantic Refining Company in 1929. H. J. Ness is vice-president, in charge of sales. He was sales manager for the Walker M. Levett Company for ten years and has been with the Plainfield Manufacturing Company also.

New Telephone Construction

A total of $106,000,000 will be spent by the long lines department of the American Telephone and Telegraph Company, New York, in its 1930 construction activities. This construction is a part of a nation-wide Bell System program which contemplates expenditures this year totaling more than $700,000,000. The program provides for the installation by the long lines department of about 3,000 miles of cable, more than 1,000,000 loading coils, and nearly 28,000 telephone "repeaters" in connection with new and existing cables. Additional long distance facilities will be obtained from about 760 miles of toll cable to be installed by the associated companies. Other major projects include the stringing of approximately 110,000 miles of aerial wire and the installation of carrier current telephone and telegraph systems.

Roessler and Hasslacher Chemical Company

According to a press report from Wilmington, Del., last month, the E. I. du Pont de Nemours Company of that city has entered into an agreement to purchase the entire assets of the Roessler and Hasslacher Chemical Company, New York, well known chemical firm and an important electroplaters' supply house. It was stated that stockholders of the chemical company will hold a meeting in April to act on the agreement.

Roessler and Hasslacher was incorporated in 1882. It has plants at Perth Amboy, N. J., and Niagara Falls, N. Y. According to the report, the firm will continue to operate under its own name if purchased by du Pont.

Record Sales of Brass Pipe

Sales of brass and copper pipe and tubing reached a new high total of 77,992,084 pounds during 1929, according to an estimate by the Copper and Brass Research Association.

Sales in 1929 were practically five times the 16,016,500 pounds sold in 1922, notwithstanding reduced building activity during the year. Sales in 1928 amounted to 76,777,400 pounds.

Statistics compiled by the Association show that since 1922 sales of brass and copper pipe and tubing have increased 387%. The average annual increase for the last six years is 63.67%.

Brass Ingot Statistics

Non-Ferrous Ingot Metal Institute, Chicago, Ill., reports the average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending February 28th, as follows:

Commercial 80-10-10 (1% Impurities)	16.504c.
Commercial 78% Metal	14.754c.
Commercial 81% Metal	15.004c.
Commercial 83% Metal	15.304c.
Commercial 85-5-5-5	15.539c.
Commercial No. 1 Yellow Brass Ingot	12.287c.

On March 1st, unfilled orders for brass and bronze ingots and billets on the books of the members of the Institute amounted to a total of 8,821 net tons.

The combined deliveries of brass and bronze ingots and billets by the members of the Institute for the month of February, 1930, amounted to a total of 6,898 tons.

New Source of Aluminum Reported

Press reports during the past month stated that a new source of aluminum in an ore native to the United States had been developed by Prof. S. C. Ogburn, Jr., of Bucknell University, Pennsylvania. The ore, alunite, it was stated, is a natural alumstone found in Utah, Nevada and Colorado. Professor Ogburn is stated to have developed a process of crushing this stone and then putting it through a furnace, pulverizing the mixture and finally obtaining aluminum, as well as sulphuric acid and potassium salts as by-products. The research was begun about two years ago and work is now being done to determine the cost of commercial operation.

Aluminum Monopoly Charges Dropped

The Federal Trade Commission, Washington, D. C., has dismissed the charges of monopolistic practices against the Aluminum Company of America, Pittsburgh, Pa., after five years of litigation in which the company maintained its denial of violation of the Clayton and Federal Trade Commission acts.

Annual Earnings Reports

Following are reports of net earnings, net income, net profits, etc., of various companies; some reports show assets, working capital, etc. Nets are after depreciation, interest, etc.:

Yale and Towne Manufacturing Company, Stamford, Conn., $2,588,624 for 1929, against $2,152,631 for 1928.

Hobart Manufacturing Company and subsidiaries, Troy, Ohio, $1,239,561 for 1929.

Reynolds Metals Company, $3,560,034 for 1929. Current assets, December 31, 1929, $4,486,438; liabilities, $1,090,850.

Weston Electrical Instrument Corporation, $970,041 for 1929, against $617,923 for 1928.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., $27,062,611 net income for 1929, against $20,814,940 for 1928; sales for 1929, $216,364; cost of sales, $194,371,987; net manufacturing profit, $21,992,601; other income, $2,323,743; gross income, all sources, $27,316,344.

Gorham Manufacturing Company, Providence, R. I., for year ended January 31, 1930, net income, $1,182,234, against $1,113,577 for previous year. Current assets, $5,967,358; current liabilities, $523,352.

Federated Metals Corporation, New York, declared extra dividend of 25 cents in addition to regular quarterly dividend of 25 cents on common stock, on March 21, 1930.

Aluminum Goods Manufacturing Company, Manitowoc Wis., net for 1929, $1,671,090, against $1,075,632 for 1928.

Bohn Aluminum and Brass Corporation, Detroit, Mich., $2,619,722 for 1929, against $3,185,092 for 1928.

International Nickel Company of Canada, Ltd., $22,235,996 for 1929 (including net of Mond Nickel Company, Ltd.) against $12,399,317 for 1928 (not including Mond profits). Current assets, December 31, 1929, $42,738,002; current liabilities, $10,506,163. Total assets, $181,946,699 December 31, 1929, against $95,999,408 December 31, 1928.

Revere Copper and Brass, Inc., (formerly Republic Brass Corporation) $3,379,679 for 1929, against $3,834,570 for 1928.

General Cable Corporation, New York, and subsidiaries, $4,709,160 for 1929, against $3,887,803 for 1928.

Aluminum Company of America, Pittsburgh, Pa., $24,128,509 net income for 1929, against $19,279,464 for 1928.

New Companies

Bassett Foundry Company, Adrian, Mich., has been incorporated with 5,000 shares of no par value stock, to manufacture non-ferrous and ferrous castings. Company will operate casting and grinding departments.

American Metals of Canada, Ltd., Copper Cliff, Ont., has been incorporated by Norman E. Strickland, attorney, 123 Rose Park Drive, Copper Cliff, to refine and treat copper and other metals and to operate a foundry and metal manufacturing plant. At first the refining department only will be operated, according to **Charles H. Aldrich,** manager of the **Ontario Refining Company, Ltd.,** Carteret, N. J., which is interested in the Copper Cliff plant.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

APRIL 1, 1930.

Although business at all the local metal plants during the past six months has been at the lowest ebb in several years, signs of the beginning of a slow but gradual pick-up are being seen by local leaders. In most of the plants, few departments are as yet on full time, but there has been a slight improvement in schedules during the past month.

The majority of the departments in the **American Brass Company** plant are working 10 hours, five days a week, and a very few are working 10 hours, five and one-half days a week. A number of the departments are working 9 hours, five days a week. **French Manufacturing Company,** subsidiary of American Brass, is slowly hiring back most of the men laid off two months ago. **Scovill Manufacturing Company** departments are on schedules varying from 35 to 55 hours a week, and the same can be said of the **Chase Companies.**

City assessment figures for the purpose of taxation show the physical valuations of the three largest plants as follows: **Scovill Manufacturing Company,** $13,844,620; **American Brass Company,** $10,877,770; **Chase Companies, Inc.,** $10,132,150. Scovill shows an increase of nearly $200,000 and Chase an increase of about $42,000, while American Brass shows a decrease of about $12,000. The reason for the decrease on American Brass is that considerable machinery of the old **Holmes, Booth and Hayden** plant was moved to other plants of the company during the year. These figures cover the value of the plants in this city alone.

Officers of the **Beardsley and Wolcott Manufacturing Company** deny reports that any drastic or secret changes are being made in the company's personnel, although admitting that some healthful and helpful changes are being made. Its office and sales force is being modernized, which involves some changes in personnel, and savings of $145,000 during 1930 are contemplated in these items, it is said. At the meeting of the directors last month **Francis T. Phillips** was elected treasurer in place of **Charles E. Beardsley,** who had previously been both president and treasurer. **F. E. Wolcott,** former vice-president and director, was not re-elected to either office. The officers elected are: President, **Charles E. Beardsley;** vice-presidents, **C. W. Schwank** and **Robert S. Booth;** treasurer, **Francis T. Phillips;** secretary, **Rowley W. Phillips.** The directors elected are: Irving W. Day, C. E. Beardsley, G. T. Wigmore, Elton S. Wayland, W. S. Fulton, F. T. Phillips, R. W. Phillips, H. W. Adams, Jr., C. W. Schwank, R. S. Booth and F. D. Coster. A preliminary financial statement showed assets of $2,237,000 against which the principal liabilities are 66,000 shares of common stock. Book value is rated at about $23 a share. Earnings of $93,428 are shown against dividend payments of $99,000.

Edward W. Goss, representing his father, **E. O. Goss,** president of the **Scovill Manufacturing Company,** was the principal speaker at the annual gathering of the **Plumbers Brass Goods Division** of the **Scovill Foremen's Association** at The Elton last month. He spoke on the diversification of manufactured goods at Scovill's and said the factory anticipates one of the best years of its existence. **P. H. Robinson,** superintendent of the Plumbers Brass Goods Division, praised the co-operation of the foremen with the factory officials. The committee in charge consisted of **Roy A. Ferris, John Collins, Edward Barlow, George Ottinger, Ernest Eureka, Donald McKellar** and **Edward Creen.**

Eight men charged with stealing copper from the **Chase Metal Works** and other local plants were bound over to the Superior Court by the local City Court last month. Three of the men, **Samuel Olderman, Lawrence Olderman** and **Albert Olderman,** conduct the **Waterbury Scrap Iron Company.** The others, who are negroes, are accused of the actual theft and of turning the metal over to the Oldermans. **Benjamin H. McGar,** chief chemist for the **Chase Companies, Inc.,** testified that tests of the metal recovered corresponded exactly to that stolen from his concern.

Paul Lux, secretary of the **Lux Clock Company,** has been granted a patent on a combined casing for an alarm clock and dial and has assigned it to his concern. **Charles Coryell,** assignor to the **Scovill Manufacturing Company,** has been given a patent on a toilet article container.

Walter S. Berry, director of training at the **Scovill Manufacturing Company,** last month attended the meeting of the state industrial council in New Haven, which outlined subjects to be discussed at the sixth annual conference, to be held at Camp Hazen in June. New Haven, Ansonia and Naugatuck industries will cooperate with the local industries in maintaining the conference. **A. D. Lynch** and **L. W. Olsen** of the **Ohio Brass Company** will speak.

Walter Smith of this city has been selected by the **Chase Companies** to be general superintendent of the new Chase brass plant in Cleveland, Ohio. The plant is expected to start operations early this month. **Frank T. Walsh** of this city has been chosen to head the sheet metal section of the new plant; **Frank Selby** will be foreman of the casting shop; **T. W. Reinbrecht,** general office manager, with **Harold Smith** as assistant; **E. Hepman,** purchasing agent; **W. E. Hoofe,** paymaster; and **Harry Croft,** chief metallurgist. These men have already left the city to take up residence in Cleveland. The plant will be under the general supervision of **Fred A. Jackle** of this city, general superintendent of the concern. The main building, when completed, will be 450 feet wide and 1,000 feet long and on the Nickel Plate railroad. It is on a tract of 60 acres. Total expenditures on the plant will amount to about $6,000,000. **Daniel Sullivan** of this city, millwright, has been supervising the installation of the machinery and **William Maxwell** has been supervising installation of plumbing. **Frederick S. Chase,** on his return from his present trip to Europe, will make a visit of inspection to the new plant.

United States Senator F. C. Walcott has encouraged local manufacturers to believe that the new tariff bill, which has finally been passed by the Senate, will be amended at the conference between the House and Senate so as to restore some of the higher duties on clocks, pins, buttons and other metal ware which were reduced in the Senate.—W. R. B.

Connecticut Notes

April 1, 1930.

NEW BRITAIN—Profits of the **American Hardware Corporation** for 1929, after reserves, amounted to $2,881,524. This compares with $2,920,040 for 1928. All officers of the company were re-elected at the annual meeting March 19th.

All the directors and officers of **Landers, Frary and Clark** were re-elected at the annual meeting March 19. The regular dividend of 75 cents and an extra dividend of 25 cents was declared, payable April 1.

All directors and officers of the **Union Manufacturing Company** were re-elected at the annual meeting last month.

Directors of the **Stanley Works** have declared the regular quarterly dividend of 62½ cents a share payable April 1 to stock of record March 15.

Directors of the **New Britain Machine Company** have declared the regular quarterly dividend of $1.75 a share on the preferred and 37½ cents a share on the common, payable April 1 and March 31, respectively, to stock of record March 15.

The Fafnir Company announces that the Curtiss Tanager airplane, which was the only one in the country to pass all tests in the Guggenheim safe aircraft competition, is equipped with Fafnir bearings made here.

BRIDGEPORT—The Bullard Company's net earnings for 1929, after depreciation, interest and taxes, were $993,086, according to the annual statement just published. Total assets are $5,170,952, of which current assets are $2,054,761. Current liabilities are $341,464. **President E. P. Bullard** called attention to the development during the year of the company's own process, the Bullard-Dunn electro-chemical cleaning process, which it is licensing throughout the United States and foreign countries. At the annual meeting March 19, the directors were increased from seven to eleven, the new ones being **H. C. Bullard, E. C. Bullard, J. W. Bray,** sales manager, and **T. E. Dunn,** works manager.

Damage estimated at less than $1,000 resulted from a fire breaking out on March 11 in a warehouse of the Union branch of the **Bridgeport Brass Company.** The fire was extinguished before it spread to other buildings.

MERIDEN—Earnings of the **International Silver Company** for 1929, before depreciation and income taxes, amounted to $2,154,583 and compared with $1,639,075 in 1928. Net income was $1,656,824 compared with $1,436,279 in 1928. The surplus gain was $202,916 making the total surplus now $6,248,105. Current assets are $16,356,940 compared with $16,196,976 a year ago. Current liabilities are $1,151,445 compared with $1,192,558 a year ago.

Manning, Bowman and Company, manufacturers of electrical appliances, report net profit for 1929 of $173,396, after taxes. In 1928 net profits were $204,162.

HARTFORD—Directors of the **Arrow-Hart and Hegeman Company** have declared a dividend of 75 cents a share on the common and the regular dividend of $1,62½ on the preferred, payable April 1 to stock of record March 24.

BRISTOL—Papers for the incorporation of the **Bristol Screw Corporation** have been filed in the office of the city clerk. The incorporators of the company, which plans to manufacture metal screws, are **John C. Cope, William Gerke** and **William H. Cope.** The capital stock consists of $25,000 or 250 shares of $100 each. The sum of $10,500 has been paid in.

STAMFORD—Net earnings of the **Yale and Towne Manufacturing Company** for 1929 amounted to $2,585,624, compared with $2,152,631 in 1928. A new special reserve of $1,000,000 for contingencies has been set up and the surplus item increased $1,611,576 to $13,277,516. Net sales amounted to $18,734,066, an increase of $1,200,000. Expense and depreciation amounted to $16,356,746, an increase of $800,000. **Schuyler Merritt,** chairman of the board, calls attention to the purchase during the year of the assets of the **Stuebing Cowan Company** of Cincinnati for 27,256 shares of Yale and Towne stock, valued at $2,057,920, and the purchase of **H. and T. Vaughan, Ltd.,** of England, the largest makers of locks in the British Empire. The purchase price of the latter was 19,400 shares of stock, valued at $1,455,000.

Seth E. Thomas, fifth of the name, was re-elected president of the **Seth Thomas Clock Company** at the annual meeting of the company held here March 6. The other officers were also re-elected.

BERLIN—Directors of the **Goss and DeLeeuw Machine Company** have declared a quarterly dividend of 3 per cent, payable April 1 to stock of record March 18. This is an increase of one per cent.

TORRINGTON—Directors of the **Torrington Company** have declared the regular dividend of 75 cents a share, payable April 1.

MIDDLETOWN—Russell Manufacturing Company will open a new branch office and warehouse at Detroit, April 1. **F. Fuhrman** will be division manager with **P. H. Burns** as assistant, and a sales force of 33 men. There will also be a credit manager and a service manager.

—W. R. B.

Correction

In this section, page 99, February, 1930, issue, it was erroneously stated that the S. L. and G. H. Rogers Silver Company, Wallingford, Conn., is a branch of the International Silver Company. This should have read: "branch of Oneida Community, Ltd., Oneida, N. Y.," etc.

Providence, Rhode Island

April 1, 1930.

The end of the first quarter of 1930 finds all lines of the metal trades beginning to awaken from the lethargy in which they have been for several months and the outlook is considerably more encouraging, although there is the largest number of unemployed in this city and vicinity of any time since before the world war. With millions of dollars' worth of new building projected, all the building trades are certain of full schedules for some months to come. As soon as the tariff controversy is ended and the manufacturers may know where they are, the jewelry business is due for a speeding up in all the allied and co-ordinate lines. With these two great groups of industry active, there is bound to be a stimulation in the tool and machine trades, so that the whole outlook is one of optimism. Report of the State Commissioner of Labor for the month of February indicates a substantial increase in the number of employed over that of January and a still larger increase over December. Compared with February of a year ago, the increase is nearly one-tenth smaller.

The annual report of the **Gorham Manufacturing Company,** issued the middle of month for the twelve months ending January 31, 1930, shows net income was $1,182,234.72, which is an increase of $68,657.33 over the net profit of $1,113,577.39 earned in the previous fiscal year.

The Foster Jewelry Company, Inc., has purchased the plant of the **C. H. Chapman Company** and will operate it as a going concern under the name and style of the **Chapman Jewelry Company.** The same line of goods will be manufactured as heretofore, with many salable additions. The plant will be operated under the personal direction and management of **H. C. Foster** of the Foster Jewelry Company and the latter concern will continue to manufacture a line of sterling silver novelties and jewelry to be sold at popular prices.

Horace M. Peck, secretary of the **Manufacturing Jewelers' Board of Trade,** has been appointed receiver of **Gartner and Skoog, Inc.,** manufacturing jewelers at 101 Sabin Street, under bond of $5,000. The petition for receivership was filed by **Grover C. Haberlin,** stockholder and treasurer of the corporation, who set forth that the company was unable to meet its obligations as they became due.

The Durant Manufacturing Company, Milwaukee, Wis., has removed its New England branch factory and warehouse from the Herrick Building, 36 Garnet Street, to the ground floor of the Fitzgerald Building, 183 Eddy Street, where they will have considerably more floor space. The New England branch is under the management of **Leo A. Naurie.**

The Modern Plating Company, Inc., is now located at 41-45 Hospital Street, where it has greatly increased capacity for its business. The concern is constantly experimenting in its branch of the jewelry industry and has recently brought out a new white finish for jewelry which is trade marked "Algolium," which the firm claims has a soft pleasing tone with lasting qualities.

A permit for the erection of a new manufacturing building by the **Eastern Products Corporation** at 21 Gordon Avenue, has been issued. The new structure is to be two stories in height, brick, 107 x 78 feet. It will be used for manufacturing jewelry; it will cost approximately $85,000.

The American Screw Company, one of the oldest manufacturing organizations in Providence, is inaugurating a new method of distribution of its product and increased business is expected to result. While the idea is simple, it has never before been applied to screws. It is merely the use of an attractive display carton which carries sixty small packages of screws, six boxes of each of the ten leading screw sizes. The dealer puts a carton on his display table; his customer picks out the size and quantity he wants and pays a nickel per box. The necessity for weighing or counting small quantities of screws for the customer is done away with. Each box contains a sufficient number of screws for the average household job.

The Tri-Pen Manufacturing Company, 14 Blount Street, makers of pens and pencils, will remove in a short time to a building which it has purchased at 581 Pawtucket Avenue, just over the city line in Pawtucket. The purchase price is understood to have approximated $30,000. **Vice-President Harry M. Burt** states that the transfer will be effected as soon after April 1st as possible, present leases on the property running until that date. Approximately 16,000 square feet will be available for office and manufacturing purposes. The company is at present marketing its product and needs the additional space for expansion. Officers of the company are the same as those of the **Triad Manufacturing Company,** Pawtucket, makers of radio tubes.

The Brown and Sharpe Manufacturing Company has announced a new product, the No. 590 telescoping gauge, for use with micrometers. These gauges comprise five heads which are interchangeable on one handle. The telescoping head is compressed and inserted into the hole or slot to be measured, where it expands to the exact size of the hole. A turn of a knurled screw on the end of the handle locks the head and the gauge is then removed and measured with a micrometer. Each head is a self-contained unit. Measuring surfaces of the heads are ground on the radius of the smallest hole the gauges will enter, thus adapting them especially for measuring curved surfaces. The ends of the heads are hardened.

Plans to send six members of the Providence Division, **American Brass Founders of New England,** to the foundrymen's convention to be held at Cleveland, May 12-16, were discussed at the regular meeting of the division held at Narragansett Hotel, Providence, on March 19. While the delegates have not been announced, it is stated that at least half a dozen members of the local division will attend the convention. **H. E. Bryant,** statistician, and **William Bonner,** general secretary of the Boston organization, spoke on the progress being made by the Boston division, which is the parent organization of the Association. **William Morgan** presided.

—W. H. M.

Middle Atlantic States

Trenton, New Jersey

APRIL 1, 1930.

The metal and plating plants of Trenton and vicinity are beginning to feel the general business depression and orders have dropped off considerably in some instances. Manufacturers, however, are hopeful that business will gradually pick up again. The big plant of the **J. L. Mott Company** is only operating part time.

H. A. Smith Manufacturing Company, Inc., Hopewell, N. J., has filed a certificate of dissolution in the office of the Secretary of State. The stockholders consented to the dissolution proceedings. The concern manufactures metal novelties.

Harold T. Parker, attorney, of Mount Holly, has been appointed by **Vice-Chancellor Leaming** as receiver for the **Victor Metal Aircraft Corporation** of Mount Holly. Difficulties were encountered after the first plane was finished late in the fall and since then plans leading to the receivership have been in progress. The company places its assets, including building, machinery and one plane built, at $23,000, and the liabilities are put at $25,000.

Stuart and Peterson Company, Burlington, N. J., makers of cast iron, enamel and hollowware, has filed a petition in bankruptcy in the United States Court at Trenton. The liabilities are listed at $52,963.13 and the assets at $31,966.09. The petition was signed by **Duncan O'Connor,** president of the company. The plant is valued at $29,000.

Keystone Aircraft Corporation, Bristol, Pa., announces that it will shortly employ 400 more hands and erect houses for some of the new help. The company has many new orders, including both airplanes and flying boats.

Samuel Jackson Sons, Inc., Philadelphia, Pa., has purchased five acres at Bristol, Pa., and will erect a plant for the manufacture of railroad signals, fuses and flares.

The following concerns have recently been incorporated here: **Vitalite Company,** manufacture metal cloth, 20,000 shares no par, Jersey City. **Willow Metal Radiator Cabinet Company,** manufacture radiator enclosures, 1,000 shares, Jersey City. **Ther-O-Nold of Hackensack, Inc.,** $25,000, manufacturing electrical appliances. **Jersey Can Company,** 1,000 shares, manufacture cans, Bayonne. **William C. Golding, Inc.,** manufacture jewelry, Elizabeth. **Fischer-Sweeney Bronze and Aluminum Company,** 2,500 shares, manufacture bronze, Jersey City. **New Jersey Automatic Corporation,** make automatic machines, $50,000 and 5,000 common shares, Atlantic City. **Alunite Products, Inc.,** manufacture mineral products, $100,000, Camden.

—C. A. I.

Newark, New Jersey

APRIL 1, 1930.

Kirchhof Patent Company, 60-64 Union Street, is now manufacturing tin toys in its new factory. The product includes little tin shovels, crickets, whistles, tops and various other kinds of toys. The company first began the manufacture of tree candle holders balanced by lead balls. **Charles Kirchhof,** founder of the company, held patents on tin-made toys. He established his plant in 1865 and in 1879 he died, leaving the plant in charge of his widow. The plant is now under the management of **Carl H. Dietze.**

William Prym, Ltd., a German concern, will erect a $1,000,000 plant at New Brunswick to manufacture stamped wire novelties. The object of establishing a factory in this country, it is said, is to avoid the duty on goods sold in America. This item alone cost the company many thousand dollars a year. The company employs many hands.

Driver-Harris Company, Middlesex Street, Harrison, N. J., will erect a two-story brick and steel addition at that place, to cost $250,000.

L. S. Brach Manufacturing Company has leased a two-story and basement industrial building at 51-63 Dickerson Street, and 84-92 Duryee Street. The company was established 24 years ago and has been located on Sussex Avenue for fifteen years. The concern originally manufactured a line of railway signal devices and is now producing a line of electrical protective devices, electrical instruments, clocks and radio accessories.

The following Newark concerns have recently been chartered: **Superior Welding Company,** welding and repairing, $100,000. **Lehigh Metals Company,** metal shares, 200 shares. **Doring Manufacturing Company,** manufacture lighting fixtures; **Sunshine Products Corporation,** aluminum products, 50,000 preferred and 1,000 common. **Maison Claire, Inc.,** manufacture jewelry, $10,000. **Mack Connector Company,** manufacture jewelry tools, $75,000. **Beacon Manufacturing Company,** manufacture cutlery, $100,000. **Century Manufacturing Company,** chemicals, $100,000. **Bloomfield Lathing Company,** metal and wood lathing, $50,000.

—C. A. I.

Middle Western States

Detroit, Michigan

APRIL 1, 1930.

General business in this area within the next six months or a year will be largely controlled by the revival of the motor industry. No one can make much of a forecast, although there has been something of an increase in motor production.

The labor barometer of the Detroit board of Commerce indicator that industrial employment here is definitely on the upgrade. That indicates, of course, the motor car companies are getting under way again. All this means also that activity at non-ferrous metal plants is on the gain. But just at this moment every one would like to see conditions much better than they are.

Unquestionably, there is going to be a general revision in production schedules in all lines of industry in the Detroit area. This will slow up many plants, with production more evenly distributed throughout the year.

Many authorities declare that within 60 days Detroit will be back again to its old-time business peak. Others, however, believe such predictions are over optimistic and that it will be much longer before manufacturing and business again are back to normal. At present a great majority of Detroit non-ferrous metal plants are either idle or operating on extremely reduced schedules.

Carlton S. Smith, assistant secretary-treasurer of **Copeland Products, Inc.,** at Mt. Clemens, Mich., reports a steady increase in business since the first of the year, with a corresponding increase in employment. He also announces that January and February sales and shipments exceeded all comparable months in the company's history. On February 1 the company had on hand unfilled orders for more units than were shipped during the entire month of February, 1929.

R. S. Deering, well-known in automobile manufacturing circles, has been appointed general manager of the **Verville Aircraft Company,** Detroit. Mr. Deering was president of the **Stevens Duryea Company** and also of the **Rausch and Lang Electric Company.** He has been connected for 20 years with the manufacture of automobiles and yachts. The Verville firm builds a four-place cabin monoplane, designed primarily for the private owner.

The Welding Equipment and Supply Company, 2232 Buhl Building, Detroit, is a new Michigan corporation. It manufactures and deals in welding equipment and supplies. The owners are **Harry Butler, Doris A. Butler** and **A. H. Cudlip,** all of Detroit.

The C. M. Hall Lamp Company reports a net profit of $1,158,616 for the year ending December 31, 1929. This compares with $1,027,332 in 1928. Current assets at the end of 1929 totaled $2,100,674 against current liabilities of $176,815.

The Detroit Lead Pipe Works announces the establishment of a branch office in Detroit, at Alma and Hayes Avenues, in order to better serve the company's east side customers. It is in charge of **Joseph Quirk.**

Bohn Aluminum and Brass Corporation, announces a $1,000,000 expansion program. **Christian W. Brandt,** Detroit architect, has been engaged by the company to prepare plans for an additional group of buildings, it is stated. The company has declared its regular quarterly dividend of 75 cents a share, payable April 1, on stock of record of March 14. The 1929 report of the company and its subsidiaries shows a net profit of $2,619,722 after interest, depreciation and federal taxes.

The name of the **Mid-West Company,** has been changed to the **Mid-West Abrasive Company,** it is announced.

McCord Radiator and Manufacturing Company, and its subsidiaries report for 1929 net income of $618,490 after interest, depreciation and taxes.

Parker Rust-Proof Company reports a net profit for 1929 of $378,251 after federal taxes and all other charges.

Engineers of the **AC Spark Plug Company,** Flint, Mich. have developed an improved alloy for spark plug electrodes, according to a recent announcement. "While the new alloy was developed some time ago by **Hector Rabezzana,** chief spark plug engineer, and **Donald Rudolph,** research engineer, in collaboration with their associates at the University of Michigan, announcement of the achievement has only recently been made. The new electrodes have been in production and used in spark plugs for many months, it is stated.

As an expansion program, the **Champion Spark Plug Company** has completed a second Dressler tunnel kiln. It now is in operation in the Hamtrack, Mich., plant of the **Champion Porcelain Company.** With improvements resulting from experience, the new kiln in the main duplicates the one which the porcelain organization has had in service for ten years and in which sillimanite spark plug cores used by the company have been fired during that time.

It is reported that a mammoth concentration project, which calls for ultimate location of major manufacturing operations at Dearborn, Mich., is being completed by the **Ford Motor Company.** This company, it is stated, is now contemplating the transfer of the Lincoln motor car works, at Warren and Livernois Avenues, Detroit, to the River Rouge site. The Fords already have shifted key production units from the old Highland Park plant to the River Rouge works. **Nash Motor Company,** with plants at South Milwaukee, Kenosha and Racine, Wis., is mentioned as a possible lessee of the present Lincoln factory. However, there is no confirmation of this report at the Nash headquarters.

The Essex Wire Corporation, 37 Manchester ave., Highland Park, Mich., was recently incorporated. The owners are **Addison E. Holton, Harold A. Strickland** and **Lola M. Adkins.**

—F. J. H.

Cleveland, Ohio

APRIL 1, 1930.

David C. Elliott, economist of the Midland Bank in this city, makes an interesting analysis regarding the future of Cleveland's manufacturing. "Reliable indications," he says, "point to the fact that the automobile industry in Cleveland is regulating production to consumption to a degree unequaled in the past five years, and that recovery is to be expected later in the year." These indications, he says, are: "Ratio of consumption of new passenger cars to production in January, 1930, was 84 per cent, as against an average of 81 per cent for the same month in the five preceding years. On the assumption that the industry will produce and sell as many cars this year as in 1928, it was 87,000 units behind the normal rate of production for the period from January 1 to March 8. As a result of the recent drastic cut in production, consumption in the 12 months ending January 31 as compared with production, was slightly higher than normal. One of the most important factors bearing upon the recovery of business is the position of the automobile trade," Mr. Elliott says. "If this leading industry enters the last six months with production scaled down to actual consumption and with low inventories of new and used cars, prospects for good business will be much brighter than otherwise."

Manufacturing in the non-ferrous industries at present is decidedly quiet in Cleveland as it is in other industrial centers of the middle west, although in some quarters it is stated that production of automobile parts and accessories has turned definitely upward. However, conservative and moderate improvement in the non-ferrous field is predicted for the next few months.

The Wheeler Metal Products Corporation, manufacturers of automobile parts, recently completed a $200,000 addition to its plant, which means an increase to four times its former capacity. In spite of the business depression, this company shows an increase in sales over last year due to increased facilities.

—F. J. H.

Wisconsin Notes

APRIL 1, 1930.

The Milwaukee Die Casting Company, Milwaukee, has purchased land for future expansion that will double the size of its present plant, according to an announcement by **Henry F. Schroeder,** vice-president and manager of the concern. The 28,000 square feet floor space of the present plant will be increased to 45,000 square feet. The company supplies the automotive industry with zinc and aluminum die castings

and babitt-lined bearings. The alloys it uses were developed from zinc base alloys originally used in toys into new metals of greater strength. Its products are largely used in gasoline pumps, carburetors and fly wheels for automobile and motor boat engines. The concern was originally the **American Safety Appliance Company,** started in 1909 by **Henry Schroeder.** This became the Milwaukee Die Casting Company in 1913, and three years later a brother, **Fred J. Schroeder,** became president of the company.

Perfecting a new process of metal plating, the **Eckhart Manufacturing Company** of Port Washington is looking forward to increasing its output of art products this year. The company expects to do a $200,000 business this year, according to **Joseph Schowalter,** president. About $10,000 of new equipment has been installed to carry on the new work. The company makes book ends, ornamental lamps and other table and mantel goods. The new electroplating process puts a heavy, one thirty-second inch plate upon metal castings, giving them the effect of handwork and greater strength. Copper and bronze plate is now being turned out and gold and silver will be added within 30 days. The demand for this type of art goods is increasing, according to Mr. Schowalter. The plant's season was increased from 5 to 11 months last year and it is hoped that the new line will extend it to a 12-month year. The company will continue to manufacture its former line.

The National Enameling and Stamping Company, Milwaukee, had net profits of $333,538 in 1929, after depreciation, interest and federal taxes. In 1928 the company reported profit of $378,236 before federal taxes.

—A. P. N.

Other Countries

Birmingham, England

MARCH 21, 1930.

The annual meeting of the **Birmingham Jewellers' & Silversmiths' Association** and **Allied Trades Manufacturers' Federation** was held in Birmingham on March 10. The President, H. R. Wright, said the year under review had been marked by a real and steady, if rather slow, recovery in the trade, notwithstanding the rather serious setback in the autumn, due to financial troubles at home and abroad. There were evidences everywhere of the return to fashion of jewelry and the use of silverware. The membership had kept up wonderfully well in view of all the circumstances, he said, and there were now 431 members of the association. The relationships with the allied organizations increase each year with the greater development of mutual interests. These relations had now extended overseas, and for the first time in the history of the trade they would have an opportunity of welcoming their foreign friends at the **International Jewelry Congress** in London in May. The composite exhibit at the **British Industries Fair** had been in even greater success than last year. There were twice as many home buyers at Olympia this year as there were last. The exhibitions committee also had under consideration the exhibition to be held in Buenos Ayres in 1931. With the revival of trade there had been more enquiries for boys from the school, and every effort was being made to get suitable boys into the school and to give them a training which would make them of real use to the trade. The shortage of craftsmen in the trade was already becoming evident, for he learned that London firms were advertising in the Birmingham papers for them. In view of the shortage, he urged them to encourage their own employes to attend the jewelers' school. In the overseas and intelligence department the evidences of trade revival were manifest. For the first time, members took part in the **Canadian National Exhibtion,** Toronto, under the auspices of the **Federation of British Industries,** and sent out a small composite exhibit. This attracted a good deal of attention and, having regard to the smallness of the exhibit, was quite successful. Efforts would be made to organize it upon a larger scale this year, and he appealed to members who had a chance of doing business in Canada, or had done business and had not entered, to go in for the exhibit.

Reports from the non-ferrous metal trades show that business is still far from satisfactory. Unemployment is increasing rapidly in this district and the rolling mills are experiencing the depression which hangs over British industry. The great difficulty is to get buyers to place business for forward delivery, the general rule being to order on a hand-to-mouth basis. A reduction of one farthing (English money) per pound has been made in rolled brass. This, it is explained by prominent manufacturers, is not due to any fall in the price of copper, although they feel that if any movement does take place in that metal it will be in the downward direction. They are, however, anxious to do anything that may help in restoring industry to prosperity.

Aluminum hollow-ware makers are among the fortunate class who are able to provide steady employment for their work people. The home market is fairly satisfactory and in certain export markets the position is hopeful. As regards Australia, however, business has been suspended owing to the heavy increase in tariffs against British goods. For the time being this has stopped the flow of orders, but Birmingham makers hope to regain some of this trade. Competition is exceedingly keen among British makers of aluminum. So many firms have sprung up in this industry that price-cutting has been rife but, on the other hand, a number of these firms have been short-lived. Aluminum is being increasingly used for component parts of motor cars, but the demand for this class of goods is being curtailed owing to the uncertainty which surrounds the British tariff situation. It is felt that there can be no improvement in the motor trade, and consequently in the demand for components, until the Chancellor of the Exchequer reveals his intentions in regard to these duties which, it is contended, have done so much to put the British automobile industry on a sound footing.—J. A. H.

Business Items—Verified

The Harshaw Chemical Company, Cleveland, Ohio, has removed its executive and sales offices to 1945 East 97th Street, Cleveland. The new telephone number is Cedar 6300.

Skinnell Silver Plating Company, 155 West Twenty-ninth Street, New York, has leased space at 248 West Twenty-third Street, and will remove its plant there in order to gain increased facilities.

Electric Machinery Manufacturing Company, Minneapolis, Minn., has taken new quarters for its Baltimore, Md., office, at 600 North Calvert Street. It was formerly at 432 North Calvert Street.

Warren Telechron Company, Ashland, Mass., has placed a contract for construction of an additional factory unit to cost about $150,000. The company is associated with the General Electric Company.

Metal Finishers Machine Company, Cleveland, Ohio, making grinding, polishing and buffing equipment, has moved its factory and general offices from 1931 West 47th Street to larger quarters at 2231 West 61st Street.

Barclay Manufacturing Company, North Bergen, N. J., manufacturer of metal toys, has leased a two-story factory at 934 Hoboken Street, totaling 12,500 sq. ft. of floor space, which will be remodelled for a new plant.

Whalen-Noxon Lamp Corporation, West Adams and Oneida Streets, Syracuse, N. Y., has installed facilities for chromium plating of automotive equipment. The company has hitherto operated a plating plant for copper, nickel and silver finishes.

Diel Watch Case Company, 311 Grand Street, New York, has leased space in the building at 395 Fourth Avenue, for

new plant of increased capacity. Company operates tool room, spinning, stamping, soldering, plating, polishing and lacquering departments.

D-X Engineering and Sales Company, Ltd., 2202 Queen Street East, Toronto, Ontario, is contemplating installation of an electroplating department in connection with its present automobile accessory supply business, according to **George R. Archdeacon,** president of the company.

Chas. F. L'Hommedieu and Sons Company, Chicago, Ill., has been appointed distributor of products of the **General Abrasive Company,** Niagara Falls, N. Y., for Illinois, Indiana, Wisconsin, and the West. The General Abrasive Company manufactures the "Lionite" brand of abrasive materials.

Lewis Roe, 1050 Dekalb Avenue, Brooklyn, N. Y., is now manufacturing new pieced buffs as well as continuing former business of marketing new and used polishing and plating equipment, re-making buffs, etc. The firm also has an office and salesroom at 209 Centre Street, New York City.

Revere Copper and Brass, Inc., have opened a Philadelphia sales office at 2804 Fidelity-Philadelphia Trust Building, 123 South Broad Street. The office is under the direction of the Baltimore Copper Mills Division, with **George Giffault** as manager, and **David Hickman** as assistant manager.

Turner Brass Works, Sycamore, Ill., is installing a tramrail and roller conveyor system in its foundry. Company casts brass, bronze, aluminum and operates brass machine shop, tool room, cutting-up, stamping, soldering, brazing, plating, polishing, grinding, lacquering and japanning departments.

Leeds and Northrup Company, Philadelphia, Pa., manufacturers of electrical measuring instruments, pyrometers, potentiometers, heat treating furnaces, etc., announce the new address of their Cleveland, Ohio, office, which now has larger quarters at 1941 Union Trust Building. Former location was 1228 Union Trust Building, Cleveland.

National Lead Company, 111 Broadway, New York, has awarded a general contract for construction of a one-story factory branch and distributing branch at Dallas, Texas. Building will be 75 x 130 ft., and will cost about $70,000 with equipment. The company's southwestern headquarters are in the International Life Building, St. Louis, Mo.

Norge Corporation, Detroit, Mich., has started production of a new electric refrigerator for light socket operation. There will be several sizes, some with lacquered exterior finish and porcelain interior, some with porcelain inside and out. Hardware will be of stamped and cast brass finished in chromium over nickel. Shelves are hot welded and triple tinned.

John L. Merigold, who disposed of his electroplating business in Newark, N. J., in 1923, to go to the Pacific coast, where he has been employed by various plating firms in Los Angeles, is once more in business under the name of **Merigold Electro Plating Company,** the same name he had in Newark. His plant is at 1172 East Slauson Avenue, Los Angeles, Cal.

The Bristol Company, Waterbury, Conn., manufacturers of recording instruments, have opened a new sales and service office at Los Angeles, California, in charge of S. W. Case, district manager, and W. H. Rogers, sales and service engineer, both of whom are engineers experienced in recording, indicating and control instrument work as applied to industrial operations.

Fairmont Manufacturing Company, Fairmont, West Va., operating aluminum rolling mills and manufacturing various forms of aluminum sheet, coils, circles, strip, etc., has changed its name to Fairmont Aluminum Company. Change is purely for reasons of business policy, it being felt the new name would better indicate the company's business. No change has been made in corporate identity.

American Air Filter Company, Inc., Louisville, Ky., formerly holding company for the **Midwest Manufacturing Company,** the **National Air Filter Company,** and the **Reed Air Filter Company,** announces that these companies have been consolidated and will hereafter function as one organization under the name of the holding company. All the companies are large manufacturers of air filtration equipment.

Ferro Enamel Supply Company, Cleveland, Ohio, has a motion picture film showing vitreous porcelain enamel operations at the new washer tub enameling plant of the **Mullins Manufacturing Company,** Salem, Ohio. The picture is available for use by foremen's clubs or other organizations desiring to show it. The company also has films showing continuous furnaces and equipment in stove and kitchenware plants.

F. H. Lovell and Company, Arlington, N. J., has merged with the **Dressel Railway Lamp and Signal Company, Inc.,** of the same city, to form the **Lovell-Dressel Company, Inc.** Officers are F. Hallet Lovell, chairman; A. D. Hobbie, president; J. C. Wylie and F. W. Dressel, vice-presidents; R. C. Schatzman, secretary and treasurer. General offices are at Arlington. Both concerns make marine and railway lighting equipment, electrical goods, etc.

Waukegan Chemical Company, North Chicago, Ill., has changed its name to **Brevolite Lacquer Company** in order to indicate better the nature of its business. The company has for years been manufacturing the well-known "Brevolite" brand of lacquer and feels that this should be in the firm's name. No change in management or ownership has been made. The company has under construction a new manufacturing plant which will provide for larger production.

The Arco Company, Cleveland, Ohio, is building a new paint plant at Los Angeles, Cal., to serve the western, Latin American and oriental trade. The plant will have 16,500 square feet of floor space, and will include a paint plant 100 x 100 feet, a lacquer plant 50 x 100 feet, and a varnish plant 30 x 60 feet. Output will include the company's complete line. The plant will be operated by **Arco Company Limited of California,** a subsidiary, under general direction of **Howard Wise.** General sales manager will be **Howard Raeney;** district manager will be **E. B. Hagar.**

Merrimac Chemical Company, Inc., Boston, Mass., suffered severe damage at its Everett plant on March 14, when fire from an undetermined cause broke out and destroyed two chamber acid plants, an alum plant and several small shop buildings, as well as damaging the power house and office building. Despite the damage, the company notified its customers that there would be no interruption of business or service; it is stated further that all its competitors immediately offered to assist the company. Loss was fully protected by insurance, and reconstruction work has already started.

The National Bronze and Aluminum Foundry Company, Cleveland, Ohio, has just completed installation of an additional furnace for production of "Tenual" aluminum alloy by a patented process. The new furnace is said to be the largest aluminum unit in the world, having daily capacity of 150,000 pounds and weighing over 175 tons itself. It took seven months to build, is operated entirely mechanically; raw material is charged at one end and the finished alloy is delivered at the other. (The 'Tenual" process was noted in THE METAL INDUSTRY, August, 1929, page 394.)

The Quality Aluminum Casting Company, Waukesha, Wis., announces the installation of new heat treating equipment, consisting of a General Electric furnace of the latest type, large enough to treat 1,500 pounds of aluminum castings in one heat; recording instruments by Leeds and Northrop. This improvement, together with a large addition to its foundry completed last fall, puts the company in an excellent position to serve the aviation industry as well as others who require high strength aluminum alloy castings.

The Paasche Airbrush Company, 1909-29 Diversey Parkway, Chicago, Ill., is now celebrating its silver jubilee anniversary. At the recent annual meeting, Jens A. Paasche, president, provided a banquet for department heads and spoke of the development of modern aircoating methods since he entered the airbrush field 25 years ago. The first patent was granted Mr. Paasche in 1905 and since then he has developed the airbrush, at that time in use for artwork, to meet all the many diversified aircoating, finishing, coloring and painting needs of industry today. At the present time, Mr. Paasche holds more patents than any other individual in the field on similar equipment, it is stated, and his airbrushes now apply any coating material—from lightest to plastic, at pressures from 6 lbs. up to 100 lbs., and are adapted for manual or automatic operation.

Review of the Wrought Metal Business

By J. J. WHITEHEAD
President of the Whitehead Metal Products Co. of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

APRIL 1, 1930.

The business situation has not made the tremendous recovery that some people thought it would, but the groundwork has been laid for great improvement. It is felt that the worst is behind us. As anticipated last month, the rediscount rate has been cut and money rates are now lower than they have been for several years. The effect of this reduction has not yet filtered down to the various industries, but it certainly will. The price of commodities, which last month were falling rapidly, have, it is believed, reached bottom in most instances. If this is correct, further reductions in our rediscount rate will not be necessary. It is not, however, improbable that another cut in the rate is coming in the late spring or early summer.

The price of copper is 18c and has been at this level for about a year now. Every day that goes by is showing users of copper and copper products the advantage of a stabilized price. There is no indication that the price of copper is to be cut and it is believed that the price will stay at 18c for some time to come. Users of copper all over the world are coming to this viewpoint slowly but surely, and if the producers will stick to their guns they will ultimately receive the thanks of the entire copper industry.

It is expected that the building industry will materially improve as soon as cheap money makes itself felt. The automobile industry is feeling more optimistic and is taking an increasing tonnage of copper and brass products. It is believed that as soon as the building industry picks up other industrial activity will also increase.

Foreign buying of copper keeps up and as industrial activity increases abroad, due to lowered money rates, it will make itself felt through our exports.

The demand for Monel metal products is excellent and continues at a high peak. Those using Monel should keep their requirements well covered. The demand for nickel products is also good.

The copper and brass industries as a whole, perhaps, can see the advantages of stabilized prices from the very fact that Monel and nickel products are in great demand. As previously pointed out, the prices for all products and possibly commodities will ultimately seek a certain level and be established there. Then everybody will know where he stands and that makes for prosperity. The great mergers already consummated and now under way tend all the more to confirm this viewpoint.

As stated above, the worst is over and while it is possible that the business recovery may be a little slow, nevertheless the opinion is offered that it will be sure.

Metal Market Review

By R. J. HOUSTON
D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

APRIL 1, 1930.

Activity in copper was on a fairly good scale during March. Purchases for export made a very substantial showing in the aggregate. Demand from abroad was regarded as a reliable indicator of an encouraging outlook for European consumption. Domestic business was of moderate proportions. Interest was concentrated on nearby deliveries and reflected the cautious attitude of consumers. Increased demand should develop in the second quarter of the year with the launching of new constructive projects incident to the season when operations take on new life.

Marketable supplies of copper are the largest since 1922. New production, however, is being curtailed until consumption is able to absorb the bulk of surplus stocks. There has been a sharp slump in output within recent months. It has had no dramatic effect on the situation thus far, but undoubtedly the process will be continued until the whole position of copper is established on a healthy basis. A readjustment of conditions will eventually be accomplished. It may logically be inferred that copper will work out of its difficulties and the industry be again in position to function at a normal and vigorous rate. Meanwhile prices have been conspicuously steady and without any variation in this country. Deliveries have been comparatively small for the past four months, but the time is approaching when world consumers will have to buy much more freely to meet expanding requirements. A notable growth in demand is confidently expected during the coming months. Prices remain unchanged at 18 cents delivered Connecticut Valley points and 18.30 cents c. i. f. European ports.

ZINC

Conditions in zinc reflected further depression in this industry and market prices declined to 4.85c East St. Louis and 5.20c New York for Prime Western. There has been a lack of any strong supporting influence recently. The range of price fluctuations have been on the down grade so long that buyers seem to have become decidely apathetic to values even though gauged to favor the consumer. As a precaution against further weakness there are reports that steps may be taken to curtail smelter output at some of the western plants. Stocks in smelters' hands on March 1 amounted to 90,703 tons. There was an increase of 2,270 tons during February. Present surplus stocks are the largest in over eight years, and they are more than twice as large as a year ago. That fact by itself is sufficient to suggest the remedy urgently needed to halt further depression. Recent demand was rather slack, but there are indications that consumers will be obliged to figure more conspicuously in the market before long.

TIN

A series of sharp price declines in tin during the first half of March gave the market an exceptionally weak appearance. On a big volume of business both here and in London the price of Straits tin dropped from 37⅜c to 35.95c during the first two weeks of the month. The break brought buyers into the market on a heavy scale. The low prices stimulated activity for nearby and future positions, and later developments generated more confidence and higher prices. Under London leadership the market recovered considerable lost ground and prompt Straits rose to 37¾c. A quiet tone subsequently caused some easing in quotations from recent levels. World visible supply increased 4,549 tons during February, and on March 1 was 33,581 tons. These figures compare with 26,402 tons a year ago. This feature in the statistics had a depressing effect on market tendencies. American tin deliveries in February amounted to only 4,940 tons, and for the first two months of this year to 10,755 tons, against 15,545 tons for the corresponding months in 1929, a decrease of 4,790 tons. It is not thought, however, that consumption declined to this extent, but that stocks in dealers and consumers' hands increased last year and decreased this year. Curtailment of output appears to be decided upon, and according to reports will probably amount to a reduction in production of some 24,000 to 30,000 tons in the annual output.

LEAD

A series of pronounced demonstrations marked the movements in lead during the past month. There were five price reductions made which carried market values down from 6.10c to 5.50c New York basis. There was urgent buying at the decline and con-

sumers covered requirements heavily on the belief that the minimum rate represented bottom figures. The trend of the market changed during the last week in March, and since then there have been two price advances making present price 5.75c New York. Buyers acted promptly in covering April needs. Strength and activity were recent features, and it would not be surprising to see the market move ahead at higher figures. Stocks of refined and antimonial lead in the United States and Mexico on March 1 amounted to 49,904 tons, being a reduction of 6,666 tons since February 1.

ALUMINUM

Demand for aluminum is less keen than in the period of peak activity a year ago. Like all metals, the movement into consumption has relaxed more or less as the result of restrictive operations in the automobile and other consuming industries. Prices of the leading producers remain unchanged at 24.30c for 99% plus grade. Exports from Canada for the first two months of this year were 12,182,600 pounds, compared with 6,326,600 pounds in the corresponding months of 1929 and 3,122,000 pounds in the same period in 1928. United States output of aluminum during 1929 amounted to 225,000,000 pounds, valued at $51,864,000, compared with 210,000,000 pounds, valued at $47,899,000, in 1928, according to official returns. Imports of aluminum in 1929 totaled 48,370,921 pounds, against 37,895,832 pounds in 1928.

ANTIMONY

Trading in antimony was on a limited scale during the first half of March. Demand was considerably restrained owing to uncertainty over possible changes in the tariff rate. It seems probable, however, that there will be no change in the duty on antimony, and when this indication became known the market price declined to 8c duty paid, a drop of ½c a pound. The trend of business improved lately and a good demand from consumers and dealers was reported. Buyers were displaying interest in April-May shipment from China, and this position was quoting 5¾c c. i. f. New York, with Chinese holders firm.

QUICKSILVER

Increased offerings and limited demand were recent features in quicksilver. Prices quoted are $118 to $119 per flask.

PLATINUM

Platinum prices have been adjusted to a lower basis. Refined has shown recent weakness and quotes $50 per ounce. Supplies in Russia are said to be abundant and heavy shipments have been made from that country to Germany.

SILVER

Exceptionally depressing conditions have prevailed in silver for a long time. Price trends have consequently been downward. This is not at all surprising in view of the radical changes that have taken place in India and China. The Far East used to furnish the major demand for the world's production, but this great outlet is not in position to absorb the metal in growing volume as in past years. Developments also are tending to a world gold basis. Silver for monetary purposes is on the decline, and sales of hoarded metal have been made in large amounts. There have been some strenuous efforts to control production, but as much of the white metal occurs as a by-product of other nonferrous metals the curtailment of output is difficult. Early in March the price dropped to 39⅝c an ounce. The quotation at present is 42 cents. United States silver stocks on March 1 were 977,000 ounces against 535,000 ounces on February 1 and 642,000 ounces on March 1, 1929. There is a movement to place an import duty of 30 cents per ounce on silver. This has been approved by U. S. Senate. If adopted it may prevent hoards of silver from Japan, India and China being sent to this country.

OLD METALS

There has been a good steady movement of scrap copper into domestic channels. Refineries have taken substantial tonnages, but consumers were not such active factors in the market lately. Brass mills and foundries were not specially active. Exports of scrap copper for first two months of this year amounted to 1,555 tons as compared with 5,388 tons in corresponding months a year ago. Lead grades reflect the recent advances in the virgin metal market. Dealers buying quotations are 15½c to 15¾c for crucible copper, 15c to 15¼c for heavy copper and wire, 13½c to 13¾c for light copper, 8c to 8¼c for heavy brass, 10¾c to 11c for new brass clippings, 4c to 4¼c for heavy lead and 14½c to 14¾c for aluminum clippings.

Daily Metal Prices for the Month of March, 1930

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	3	4	5	6	7	10	11	12	13	14	17	18
Copper c/lb. Duty Free												
Lake (Del.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. o. b. refinery)	17.25	17.25	17.50	17.50	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	5.10	5.10	5.10	5.05	5.00	5.00	4.95	4.95	4.95	4.95	4.95	4.90
Brass Special	5.20	5.20	5.20	5.15	5.10	5.10	5.05	5.05	5.05	5.05	5.05	5.00
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	37.45	37.125	36.625	36.00	36.375	36.125	36.625	36.75	36.10	35.95	35.85	36.125
Pig 99%	36.75	36.375	35.875	35.25	35.625	35.375	35.875	36.00	35.20	35.00	34.875	35.125
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	5.85	5.85	5.85	5.70	5.60	5.50	5.50	5.50	5.40	5.50	5.50	5.50
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.875	8.875	8.875	8.875	8.875	8.625	8.625	8.625	8.125	8.00	8.00	7.875
Silver c/oz. Troy Duty Free	39.875	39.625	40.625	40.625	41.25	41.00	41.25	41.75	41.625	41.50	41.875	41.75
Platinum $/oz. Troy Duty Free	56.00	56.00	56.00	56.00	56.00	56.00	53.00	53.00	53.00	53.00	53.00	53.00

	19	20	21	24	25	26	27	28	31	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	18.00	18.00	18.00	17.875	17.875	17.875	17.875	17.875	17.875	18.00	17.875	17.964
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. o. b. N. Y.)	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.50	17.25	17.274
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	4.90	4.90	4.875	4.85	4.85	4.85	4.85	4.85	4.85	5.10	4.85	4.941
Brass Special	5.00	5.00	4.925	4.95	4.95	4.95	4.95	4.95	4.95	5.20	4.925	5.039
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	36.00	36.80	37.00	37.80	37.75	37.50	37.50	37.65	37.90	37.90	35.85	36.810
Pig 99%	35.00	35.875	36.00	36.75	36.75	36.50	36.50	36.75	37.00	37.00	34.875	35.926
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	5.50	5.40	5.40	5.50	5.55	5.60	5.60	5.60	5.60	5.85	5.40	5.571
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.875	7.875	7.875	7.875	8.00	8.00	8.00	8.00	8.00	8.875	7.875	8.270
Silver c/oz. Troy Duty Free	42.125	42.75	42.75	42.75	42 50	42.375	42.50	42 25	42.00	42.75	39.625	41.654
Platinum $/oz. Troy Duty Free	53.00	53.00	50.00	50.00	50.00	50.00	50.00	50.00	44.00	56.00	44.00	52.572

Metal Prices, April 7, 1930

NEW METALS

Copper: Lake, 18.00. Electrolytic, 17.95. Casting, 17.25.
Zinc: Prime Western, 5.00. Brass Special, 5.05.
Tin: Straits, 36.10. Pig, 99%, 35.10.
Lead: 5.40. **Aluminum,** 24.30. **Antimony,** 8.00.

Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $119.00. **Bismuth,** $1.20.
Cadmium, 90. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 42.125.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $43.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	12¼ to 12½
Brass Ingots, Red	15½ to 15¾
Bronze Ingots	16½ to 19½
Casting Aluminum Alloys	21 to 24
Manganese Bronze Castings	27 to 39
Manganese Bronze Ingots	15 to 19
Manganese Bronze Forging	35 to 43
Manganese Copper, 30%	25 to 35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½ to 19¾
Phosphor Bronze	17 to 21
Phosphor Copper, guaranteed 15%	21 to 24
Phosphor Copper, guaranteed 10%	20½ to 23
Phosphor Tin, no guarantee	45 to 60
Silicon Copper, 10%, according to quality	25 to 35

OLD METALS

Buying Prices		Selling Prices
14 to 14½	Heavy Cut Copper	15 to 15½
13½ to 13¾	Copper Wire, mixed	14½ to 14¾
12 to 12¼	Light Copper	13 to 13¼
11 to 11¼	Heavy Machine Composition	12 to 12¼
7¾ to 8	Heavy Brass	8¼ to 9
6¼ to 6¾	Light Brass	7¼ to 7¾
11 to 11¼	No. 1 Composition	12 to 12¼
10 to 10¼	Composition Turnings	11 to 11¼
4⅜ to 4⅞	Heavy Lead	5⅜ to 5⅞
2½ to 3	Zinc Scrap	3½ to 4
15½ to 16	New Aluminum Clips	19½ to 20
10 to 10¼	Scrap Aluminum, cast alloyed	15 to 15¼
10½ to 11	Scrap Aluminum sheet (new)	13 to 14
24 to 26	No. 1 Pewter	29 to 30
20 to 21	Old Nickel Anodes	22 to 23
20 to 23	Old Nickel	22 to 25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) ..... 27¾c. to 28¾c. net base
From Stock ..... 28¾c. to 29¾c. net base

BARE COPPER WIRE

19⅝c. to 19⅞c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c., net base.

SOLDERING COPPERS

300 lbs. and over in one order ..... 26¼c. net base
100 lbs. to 200 lbs. in one order ..... 26¾c. net base

ZINC SHEET

Duty on sheet, 2c., per pound — Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount ..... 10.00 net base
Casks, jobbers' price ..... 10.25 net base
Open casks, jobbers' price ..... 10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots..... 33.30c.
Aluminum coils, 24 ga., base price, ton lots..... 31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods.....	50c.	Cold Rolled Sheet.....	60c.
Hot Rolled Rods.....	45c.	Full Finished Sheet.....	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over N. Y. Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 44.50c. per ounce, Troy upward, according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.23¼	$0.25	$0.26¼
Wire	.23¾	.25½	.26¾
Rod	.21¼	.25¾	.27
Brazed tubing	.30⅞	....	.35⅞
Open seam tubing	.31¼	....	.34¼
Angles and channels	.31¼	....	.34¼

BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	25¾c. net base
Muntz or Yellow Metal Sheating (14"x48")	24c. net base
Muntz or Yellow Rectangular sheet other Sheating	25c. net base
Muntz or Yellow Metal Rod	22¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality.....	31⅜c.	10% Quality.....	34⅛c.
15% Quality.....	33c.	15% Quality.....	37¾c.
18% Quality.....	34¼c.	18% Quality.....	41c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, April 7, 1930

ANODES

Copper: Cast	28c.	per lb.	**Nickel:** 90-92%	45c.	per lb.
Rolled, oval	27c.	per lb.	95-97%	47c.	per lb.
Rolled, sheets, trimmed	25¼c.	per lb.	99%	49c.	per lb.
Brass: Cast	27c.	per lb.	**Silver:** Rolled silver anodes .999 fine are quoted from 45¼c., Troy ounce, upward, depending upon quantity.		
Zinc: Cast	12⅛c.	per lb.			

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Opens buffs, per 100 sections.	
11" 20 ply 64/68 Unbleached	$20.85 to 25.58
14" 20 ply 64/68 Unbleached	30.93 to 36.74
11" 20 ply 80/92 Unbleached	24.14 to 28.22
14" 20 ply 80/92 Unbleached	35.57 to 42.64
11" 20 ply 84/92 Unbleached	33.90 to 40.16
14" 20 ply 84/92 Unbleached	51.08 to 60.34
11" 20 ply 80/84 Unbleached	31.07 to 35.60
14" 20 ply 80/84 Unbleached	46.05 to 53.60
Sewed Pieced Buffs, per lb., bleached	45c to 84c

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.18	Lead Acetate (Sugar of Lead)	lb.	.13¼
Acid—Boric (Boracic) Crystals	lb.	.08½	Yellow Oxide (Litharge)	lb.	.12½
Chromic, 75 to 400 lb. drums	lb.	.19-21	Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02	Nickel—Carbonate, dry bbls.	lb.	.35
Hydrochloric, C. P., 20 deg., carboys	lb	.06	Chloride, bbls.	lb.	.20
Hydrofluoric, 30%, bbls	lb.	.08	Salts, single, 300 lb. bbls.	lb.	.12½-.13
Nitric, 36 deg., carboys	lb.	.06	Salts, double, 425 lb. bbls.	lb.	.12½-.13
Nitric, 42 deg., carboys	lb.	.07	Paraffin	lb.	.05-.06
Sulphuric, 66 deg., carboys	lb.	.02	Phosphorus—Duty free, according to quantity	lb.	.35-.40
Alcohol—Butyl	lb.	.16¾-.21¼	Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.093
Denatured, drums	gal.	.48-.60	Potassium Bichromate, casks (crystals)	lb.	.09¼
Alum—Lump, barrels	lb.	.0325	Carbonate, 96-98%	lb.	.06¾-.07
Powdered, barrels	lb.	.039	Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Ammonium chloride, solution in carboys	lb.	.06½	Pumice, ground, bbls.	lb.	.02½
Ammonium—sulphate, tech., bbls	lb.	3.3	Quartz, powdered	ton	$30.00
Sulphocyanide	lb.	.65	Rosin, bbls.	lb.	.04½
Arsenic, white, kegs	lb	.05	Rouge, nickel, 100 lb. lots	lb.	.25
Asphaltum	lb.	.35	Silver and Gold	lb.	.65
Benzol, pure	gal.	.60	Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Borax Crystals (Sodium Biborate), bbls	lb.	.04½	Silver Chloride, dry, 100 oz. lots	oz.	.37½
Calcium Carbonate (Precipitated Chalk)	lb.	.04	Cyanide (fluctuating)	oz.	.45-.48
Carbon Bisulphide, Drums	lb.	.06	Nitrate, 100 ounce lots	oz.	.32¼
Chrome Green, bbls.	lb.	.25	Soda Ash, 58%, bbls.	lb.	.02½
Chromic Sulphate	lb.	.30-.40	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17
Copper—Acetate (Verdigris)	lb.	.23	Hyposulphite, kegs	lb.	.04
Carbonate, bbls.	lb.	.21½	Nitrate, tech., bbls.	lb.	.04¾
Cyanide (100 lb. kgs)	lb.	.45	Phosphate, tech., bbls.	lb.	.03¾
Sulphate, bbls.	lb.	6.7	Silicate (Water Glass), bbls.	lb.	.02
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27	Sulpho Cyanide	lb.	.32½
Crocus	lb.	.15	Sulphur (Brimstone), bbls.	lb.	.02
Dextrin	lb.	.05-.08	Tin Chloride, 100 lb kegs	lb.	.34
Emery Flour	lb.	.06	Tripoli, Powdered	lb.	.03
Flint, powdered	ton	$30.00	Wax—Bees, white, ref. bleached	lb.	.60
Fluor-spar (Calcic fluoride)	ton	$70.00	Yellow, No. 1	lb.	.45
Fusel Oil	gal.	$4.45	Whiting, Bolted	lb.	.02½-.06
Gold Chloride	oz.	$12.00	Zinc, Carbonate, bbls.	lb.	.11
Gum—Sandarac	lb.	.26	Chloride, casks	lb.	.06¾
Shellac	lb.	.59-.61	Cyanide (100 lb. kegs)	lb.	.41
Iron Sulphate (Copperas), bbl.	lb.	.01½	Sulphate, bbls.	lb.	.03½